THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIV. No. 1893.] LONDON, AUGUST 22, 1899. [51ST YEAR. PRICE 6d.

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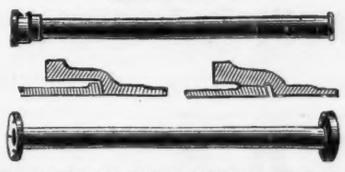

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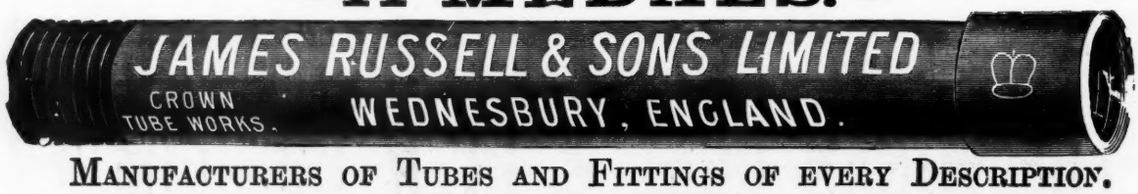

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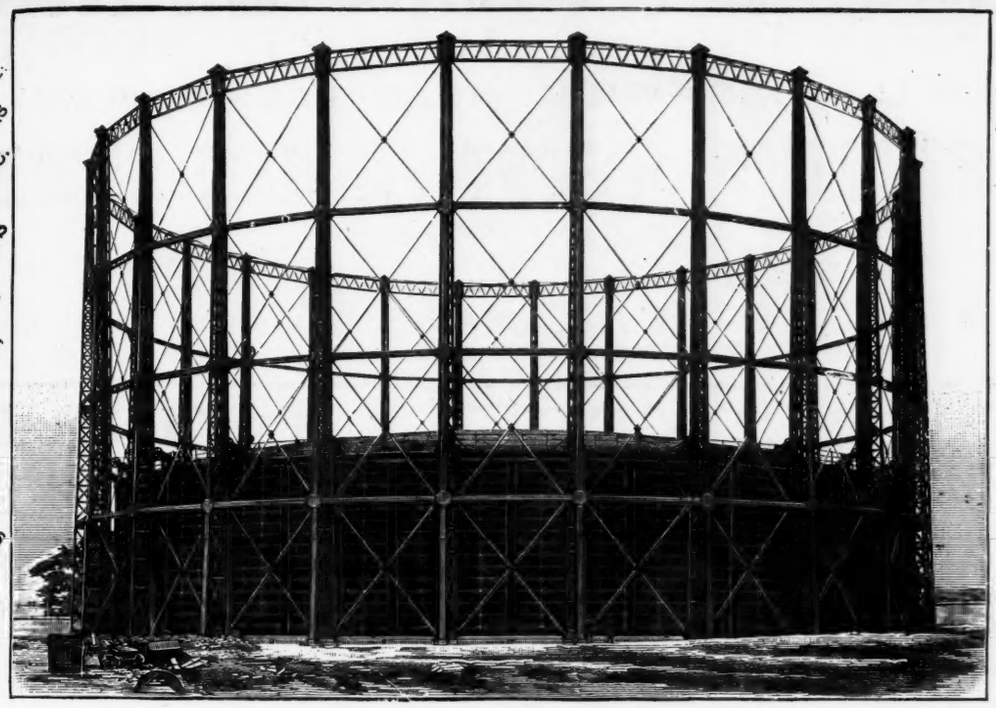

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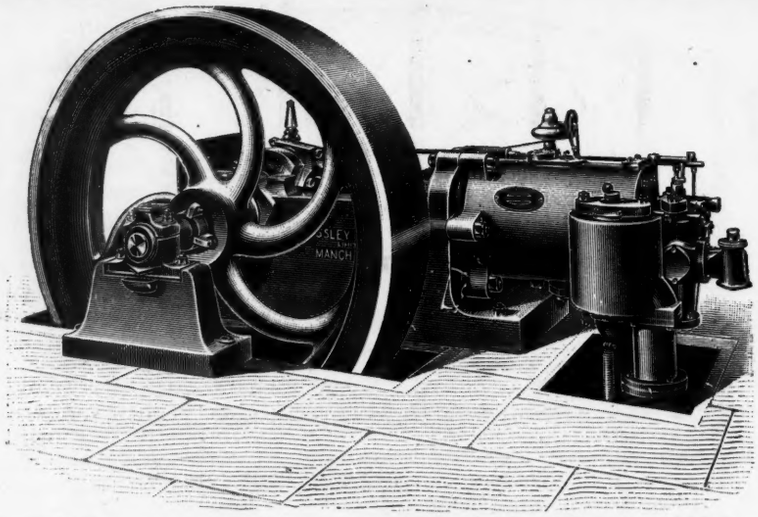

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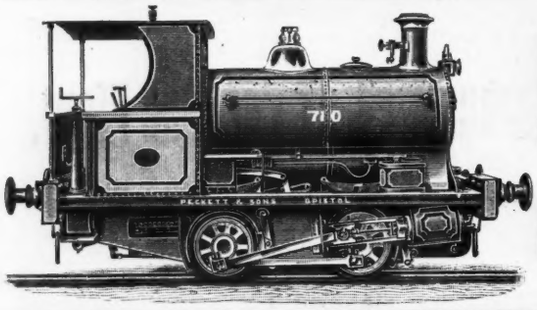

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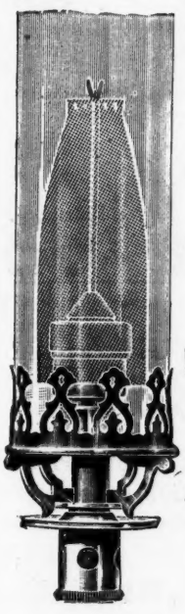

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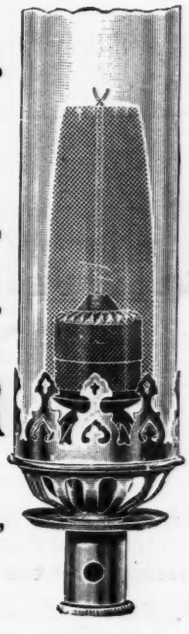

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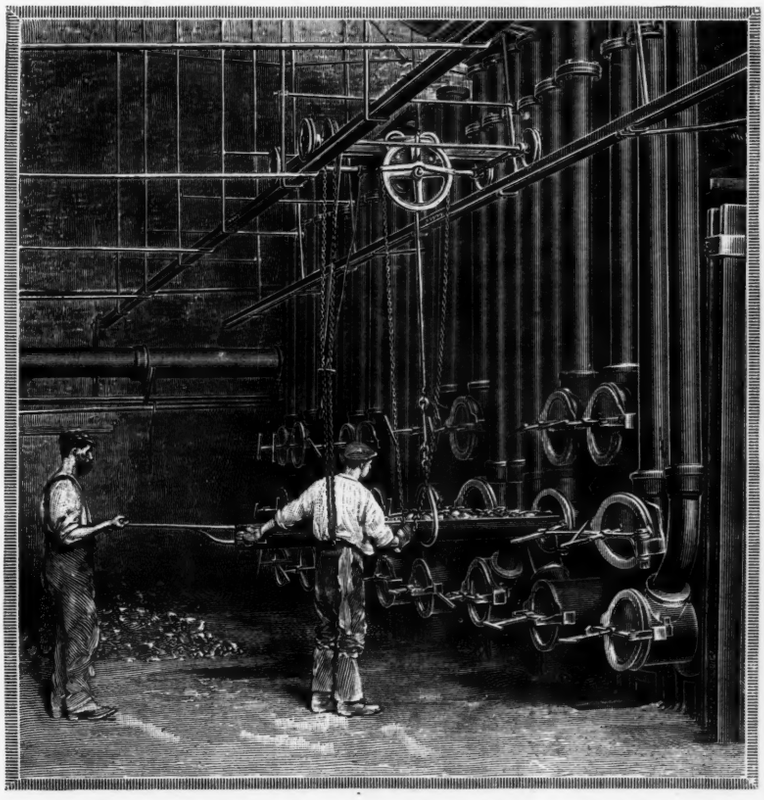

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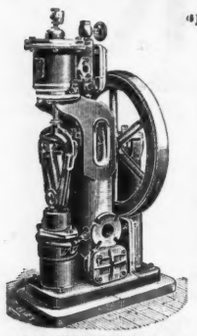

"Fig. 705. SINGLE RAM" STEAM-PUMP.

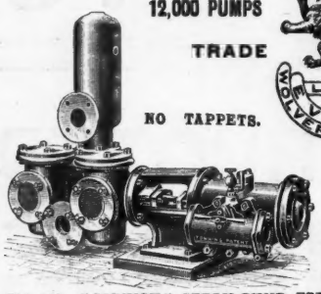

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

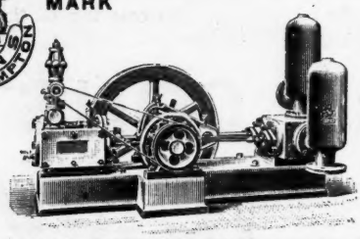

Fig. 655. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

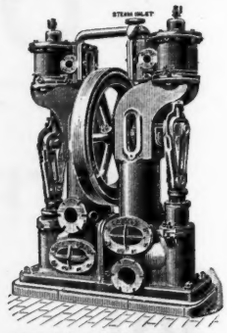

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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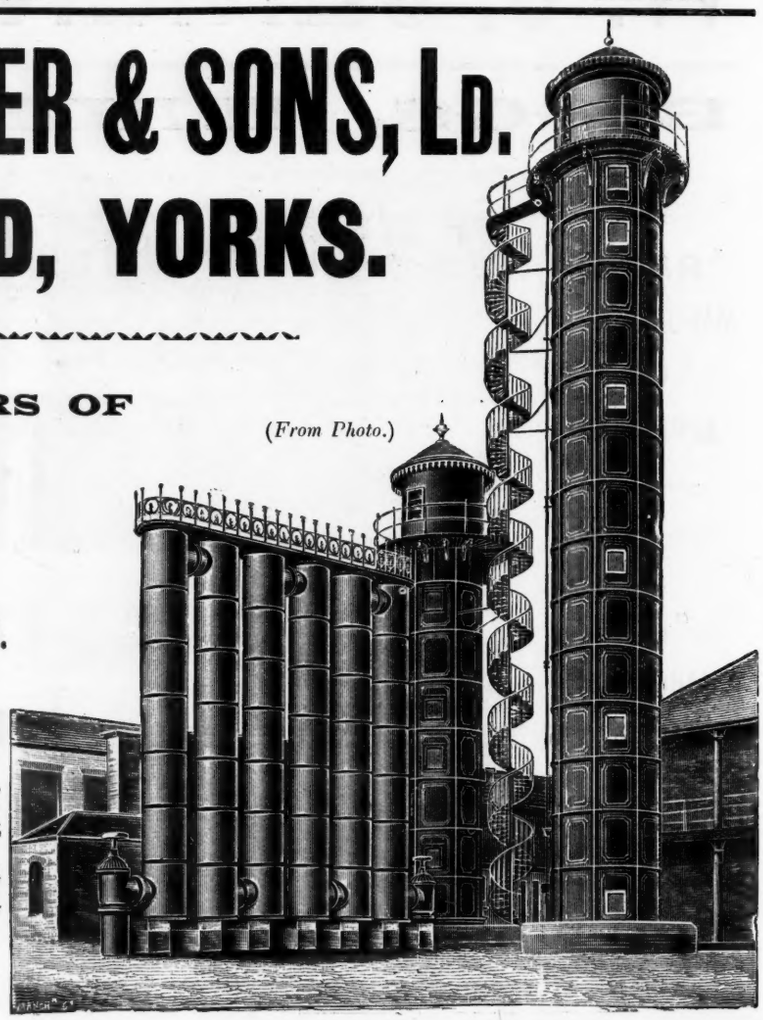

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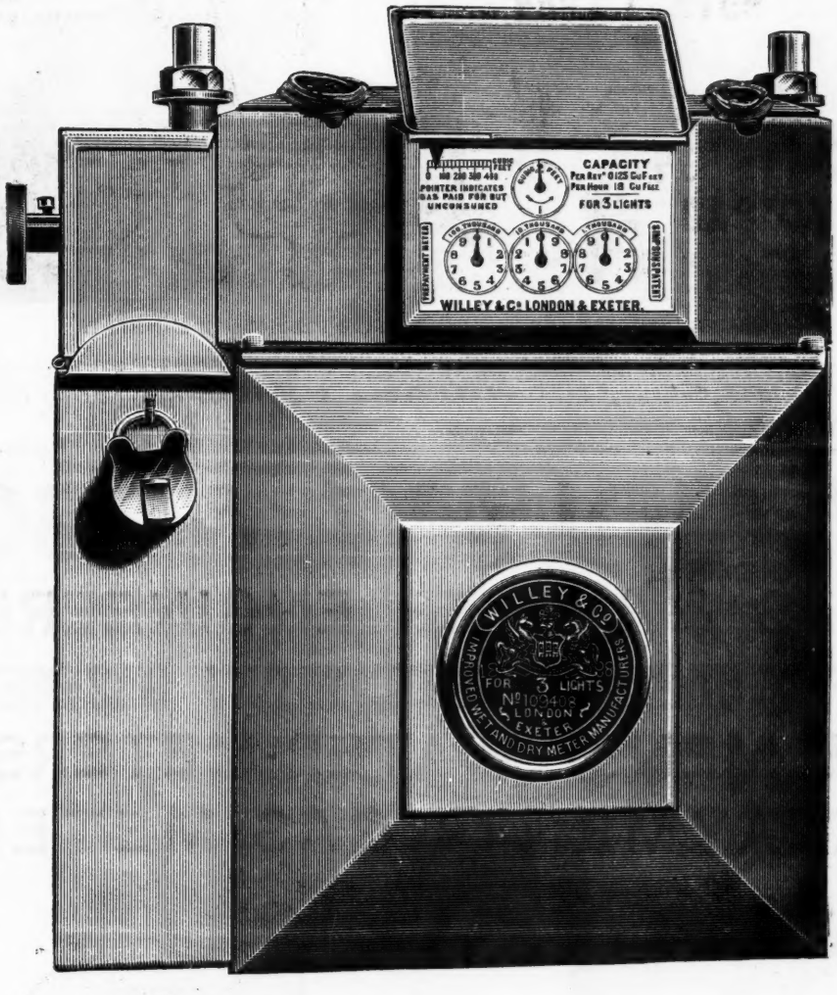

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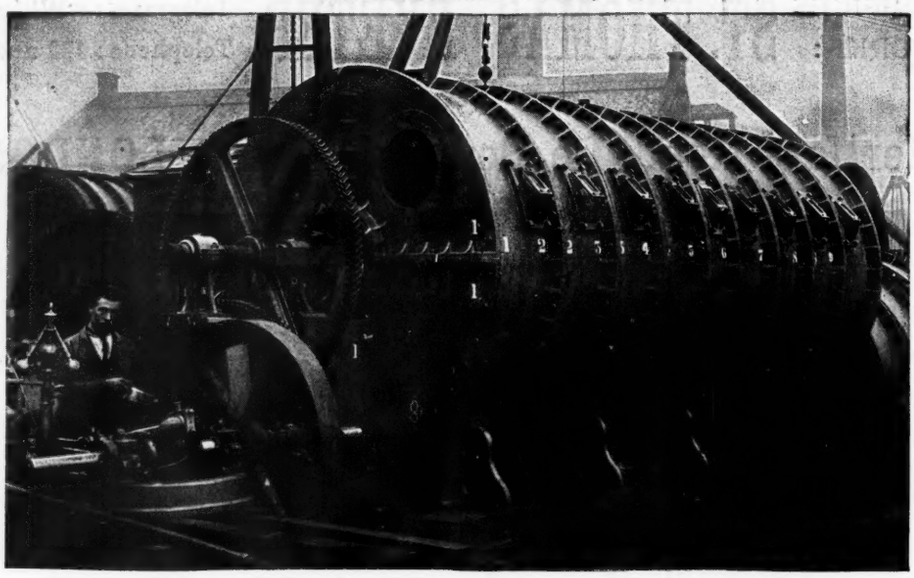

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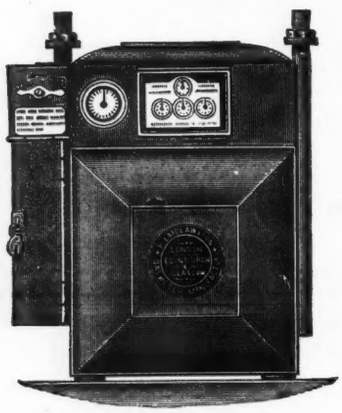

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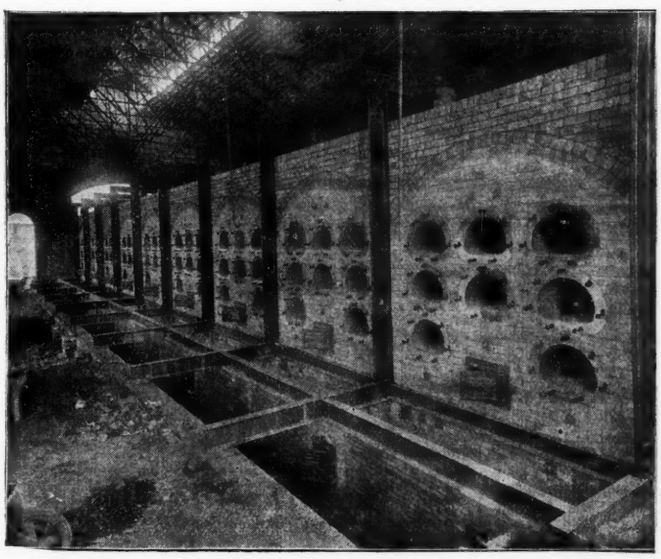

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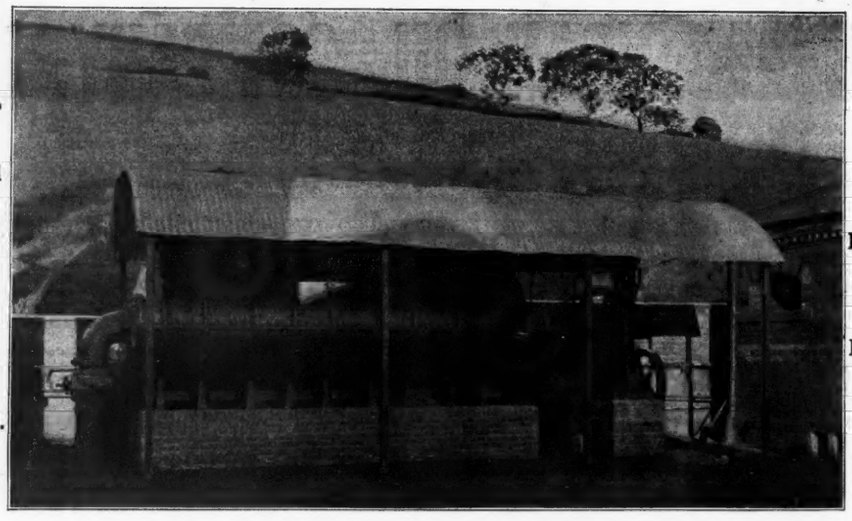

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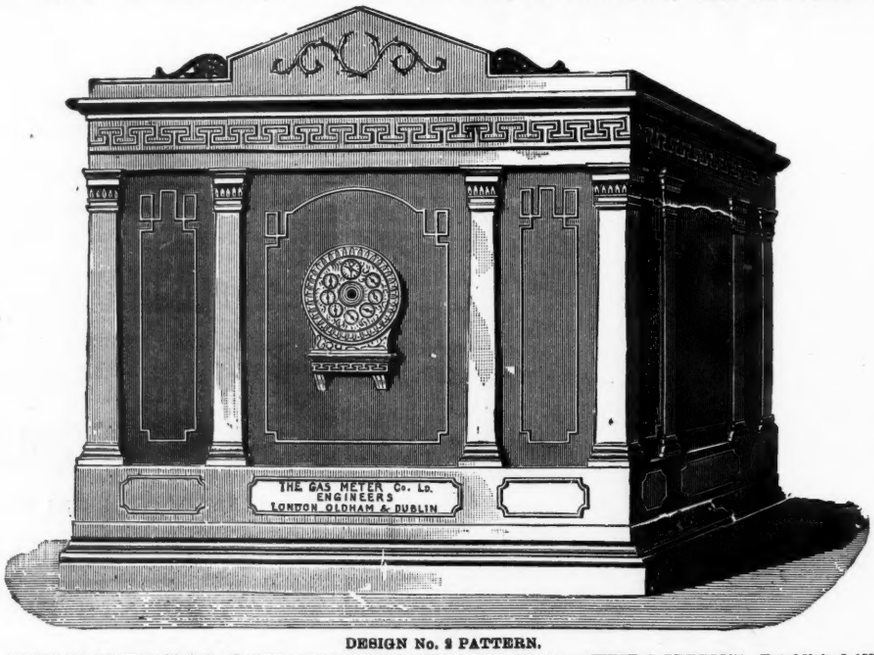

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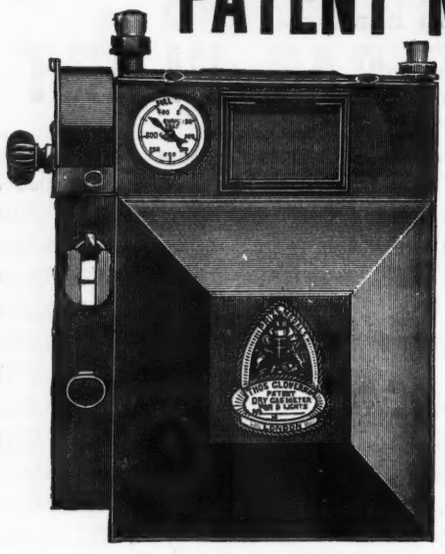

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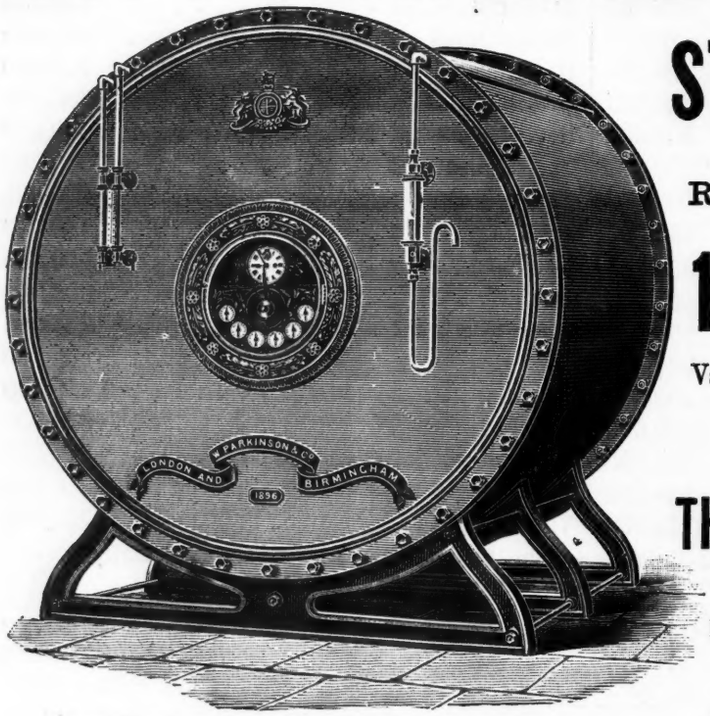

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EDITORIAL NOTES.

The Parting of the Ways in London Gas Supply.

IT is only natural that the striking—almost dramatic—situation created by the confrontation of the results of Chartered and South Metropolitan Gas Administration should force itself by degrees upon public attention. In the first place, of course, the position is realized by experts and the Technical Press, after which the financial journals begin to discuss it; and eventually the sum and substance of the matter gets into the newspaper offices. In the present case, the circumstance of the report of the Powers of Charge Committee and the holding of the general meetings of the two representative London Gas Companies coming just before the holidays, has operated to create a lull in the process of making public opinion on the subject. It is pretty safe to predict that this is only the proverbial lull before the storm; for London gas, as one of the new Directors of the South Metropolitan Company said at the meeting, in a brilliant little speech, is in the air, and the smallest spark will cause an explosion. The London County Council have given formal notification that after the holidays they will tackle the question of the gas supply in earnest; and they may be as good as their word. It is a subject for intense regret that the Council should have any excuse whatever for meddling with London gas, as they have done with London water. It was outside their purview altogether—as regards administration—until the Horseferry Road oligarchy put it into their hands. Now, of course, the Council will feel they are bound to assist Parliament with suggestions for achieving the object which the Horseferry Road magnates have owned themselves powerless to attain—the approximation of the prices of gas in North and South London to the lower ruling rate for the time being. Moreover, when the new Metropolitan boroughs come into existence, one of the first things the Corporations will think about is the price of gas; and those of the northern shore of the Thames will ask why they should any longer be overtaxed for gas.

Meanwhile, the Horseferry Road is extremely astonished that anybody should be dissatisfied with the fact that it cannot sell gas within 11d., or possibly in the near future 1s., per 1000 cubic feet of the price ruling across the river. Has not there been the same difference these thirty years? What reason is there for supposing it can ever be otherwise? The obvious answer—obvious to anybody outside the Horseferry Road Board-room—is that this statement of fact merely clinches the proof that the intention of Parliament in all the statutory regulation of the gas supply of London for thirty years has failed for the area administered from this establishment. In South London, the statutory gas settlement has justified itself. The concurrent operation of the system of the sliding-scale and auction clauses, and the policy of amalgamation, has produced the effect, in the hands of the Old Kent Road Administration, that is exhibited to-day. The amalgamating Company absorbed, one after another, other Companies which were all in a worse position as regards capital burden and selling price than itself. Chiefly on their account it has built new works down the river, and has vastly improved the distribution. But for this temporary sacrifice of the interest of the original South Metropolitan consumers to that of the gas consumers of South London as a whole, the former would have had gas at 2s. per 1000 cubic feet years ago. Now the old inequalities have been filled up; and all South London is South Metropolitan, as though it had been so from the beginning.

On the other side of the river, Fate and circumstances have combined to produce very different results from the same procedure. The amalgamating Company absorbed, one after the other, neighbours who were, almost without exception or qualification, better situated than itself as regards capital and price. It anticipated in every case, and appropriated, all the advantage which the application of the new principle in gas legislation and the advance of technics would otherwise have procured for the consumers of these old undertakings. Parliament and the Board of Trade consented to the lead in amalgamation being taken by the Horseferry Road, in the belief that the economic benefits of combination and centralization must eventually redound to the public generally, and outweigh any particular advantage that might accrue in course of time to the dwellers in one or other of the areas assigned to an old

independent Company. The expectation, reasonable as it was, was not justified by the results. Even by the time of the gathering in of the London Company—a proceeding which, on the same general grounds, was warmly supported in these columns at the period—Parliament and the Board of Trade had come to perceive that all was not going right with the gas administration of Northern London; and this, the last amalgamation, was only sanctioned on terms which we have characterized as a standing monument of distrust of the Horseferry Road. Whether this distrust is or is not justified by experience, authoritative and independent judgment must declare; and it is very certain that this judgment will not be greatly affected by the airy, and empty, phrases of the Governor, nor by the hair-splitting arithmetical excuses of the Secretary and General Manager. These are mere "pills for the earthquake," which is sure to come, sooner or later.

The fact of the source of the present perilous state of the Chartered Company being so largely attributed, in print, to what are really personal influences, renders the way of deliverance very difficult to enter from within, but easy enough to indicate from without. The material and statutory circumstances and conditions of the Gaslight and Coke and South Metropolitan undertakings being so similar, the natural inference is that the vast difference of the business result must be due to their being in different hands. Hence the obvious first step towards improvement is the getting rid of the incompetent heads who have accepted the full responsibility for the actual state of affairs by persisting in denying that there is anything wrong. But this simple step is difficult in the case of a large statutory Company. The administration of a Gas or Railway Company may be a byword for all that is wrong-headed, heedless of the just claims of the public, and generally oppressive to everybody within and outside the concern. The price of the service, whatever it is, rendered by the Company may be exorbitant; the convenience of the public may be set at naught; the officers and servants of the Company of the ordinary grades may be underpaid, overworked, and tyrannized over until those who are worth anything go off in search of other employment; the commercial firms who do business with the Company may hate its very name, and take revenge upon it by every means in their power; and there is no external remedy for this mischief. The proprietors of a Railway Company have ere now risen and made a clean sweep of an incompetent Board; but these rare exceptions only prove the general rule. Let us suppose that, instead of two London Gas Companies, it was a case of two neighbouring collieries, whereof one did thrice the trade of the other—both being private property. If the owner of the larger found that his people could not market their coal within 1s. per ton of the other, how long would it be before there was a change somewhere?

Hence it is not surprising that one consequence of the existing crisis in London gas affairs is the mooting of the question whether something cannot be done to render the heads of gas and other Companies more amenable to the ordinary discipline of business life. The world does not want any more automatic fee-takers; and it is high time that some fresh and better conception of the duty of Directors was generally received and acted upon. The proposal to sever the southern district from the undertaking of the Chartered Company has been made the occasion for some suggestions as to the creation of Boards which we reproduced last week (*ante*, p. 440). Without discussing the merits of these proposals, we unhesitatingly agree that the chief weakness of the existing system is the Olympian aloofness of the Board and their head officials. For Gas Companies, we think that the system of nominee Directors has something to recommend it. The idea that the southern district of the old London Company might be made use of for the purpose of an experiment in gas administration on new lines is open to the great objection that such a small Company as this could not now be admitted into the London gas hierarchy. Moreover, such a Company would have no works, or works too big for its needs. The idea that a Company Director should be made to realize that he has a constituency, is the correct one; and something might be done to help this forward in the case of existing Gas Companies. Enough was said at the last Chartered meeting to show that the actual system merely operates as a shield for hide-bound executives. "So long, "ladies and gentlemen, as we possess your confidence "(and a sufficient battery of proxies in reserve), we shall "continue to set criticism at defiance, and go on doing as "we have done in the past." This is the average Chairman's great formula; and who shall make him ashamed to use it?

Explanation of the Paris Gas Workers' Strike.

FURTHER intelligence has come to hand respecting the strike of gas stokers in Paris. The current number of "Le Gaz" has a long statement on the subject, compiled from the reports published in the daily newspapers. Seeing what the Paris newspapers are, and also bearing in mind that our contemporary above named claims to be of some technical value, it does not seem very exacting to expect that it would have sooner had the story direct from the Company themselves. This, however, by the way. It appears that the strike was determined upon at a meeting of the stokers' Union, held on the 7th inst. at the Bourse du Travail, by a vote of 40 to 15. There are 800 members in the Union, so that this vote was distinctly of the "snap" order. It is explained that the action of the men was based on the following considerations: The Paris Gas Company's stokers are paid at the rate of 3 frs. 30 c. per 1000 kilos. of coal carbonized, at which they earn about 9 frs. per day. This statement will surprise those who have been in the habit of thinking Continental labour cheap. In addition, each stoker is allowed 36 hectolitres of coke a year for his personal use; and gets his share of the profits (or is it benevolent funds?) of the Company, which last year amounted to an extra 31·5 c. per man. Hence it follows that a Parisian gas stoker could gain a minimum daily wage of 9 frs. 50 c. in the smaller works, rising to a possible maximum of 11 frs. 50 c. in the larger factories. How many working men and professional gentlemen of Paris touch more than this? According to most of the contemporary descriptions of life in Paris, this is riches.

Last July, after consultation with the men, the Company commenced the introduction of the eight-hour shift, experimentally. All the works agreed to try the system, with the exception of the Passy station. In the new arrangement of work, the gang coming on at seven o'clock started on the retorts and kept on until nine, rested from nine to eleven, worked again from eleven to one, rested from one to three, and worked another turn from three to five, when the shift was over. This is not exactly what English practice understands by an eight-hour shift; but it will serve. After eight days' trial, the system was approved of by the majority; and it became the rule, except at Passy. There were some complaints, however, and eventually a deputation of the men went to the Manager of the Company, and asked that the pay for carbonizing 1000 kilos. of coal should be raised from 3 frs. 30 c. to 4 frs. This was an advance of 20 per cent.; and it was refused by the management after consultation with the Municipality, which participates in the profits of the Company. Consequently, by the ridiculous vote already mentioned, the strike was declared; and all the strength of the Trade Union was pledged to the endeavour to make it general. The whole thing was child's play. Work paid for so highly did not long go begging; and after three days the strikers were glad enough to ask to be taken on again. Some of the places were filled by new recruits whom the Company declined to sacrifice; but the management was not hard upon the deluded victims of agitation.

It will be noticed that, like most French chronicles, this tale of the strike which our contemporary reproduces from the newspapers misses just the one central bit of information which is essential to a perfect comprehension of the affair. As the men were paid by the piece, what alteration did the introduction of the three-shift system in place of two shifts make to their day's work? That is what we want to know. Either the men must have carbonized less coal, and so earned less money, or they must have worked harder for the time being. There is no third way. In either case, the men would have a *primâ facie* right to some adjustment of the piecework rate. If a man is required to carbonize less coal than formerly, he must get higher pay if his earnings are not to be diminished. On the other hand, if he is called upon to make a more severe effort, in order to get the old amount of work done in a shorter time, the only immediate benefit accrues to the Company, who thereby obtain an increased production from the same plant, machinery, and ground space. If the men are willing to take the prolongation of their time off the works as recompense for their harder work while on duty, that

is their business. At any rate, they have a right to some recompense; and this is generally recognized, for we find in this country that the highest rates of carbonizing wages are paid where the three-shift system is in force. Plainly, a man who can do in eight hours what another man takes twelve hours to do, is worth more to his employers on this account. It would really be a great advantage if our foreign contemporaries would make it a rule to obtain first-hand information about matters of technical interest, wherever this is possible. But there are, unfortunately, too many so-called technical periodicals in existence which are mere scissors-and-paste compilations, put together anyhow, without care for the reliability of the report or the knowledge of the matter. Such journalistic work is a waste, and the result darkens counsel, instead of enlightening the minds of men. The ability to deal critically and suggestively with matters of technical interest may not always be at the command of the conductors of a self-styled technical journal; but, at least, they can go to the fountain-head for their news. In this instance of the Paris gas stokers' strike, the Company might have something to say which it would not answer the purpose of the daily newspapers to publish; and, if so, a journal devoted to the industry is the place for it.

The Work of Bunsen and Frankland.

A SWIFT, sudden perception of the youth of physical science and chemistry was given to the world of newspaper readers last week, in the intelligence that Robert Bunsen died at Heidelberg on Tuesday. Indeed, most of those who have more than a smattering of science, and in whose mouth the name of the great philosopher of Heidelberg is a very familiar word, must have been startled by the reminder that its owner was so recently counted among the living. For names like that of Bunsen do not carry on their face the limitation of date. They partake of the every-day freshness of the gifts to humanity which constitute their patents of immortality. There are some names, faithfully preserved as they were deservedly inscribed on the Roll of Fame, as to which the best read among us would need to think awhile if suddenly asked what the men did. Other celebrities, when named in the ears of living men, instantly recall an epoch, a stage of civilization, a phase of thought which has passed away for ever. Not so with the name of Bunsen, which, like that of Shakespeare or Darwin, awakens in the hearer the consciousness of a permanent possession. Not only is the world richer for what these men gave it, but men feel their gifts, and make daily—nay, hourly use of them. We should be at an immediate irreparable loss without them. Bunsen had the happy fortune of giving his name to several simple, indispensable inventions. He gave the world a really priceless tool in the atmospheric gas-burner, which has been a means of advancing science, arts, and industry in ways, and by a measure transcending the power of language to express. He made the most powerful kind of galvanic battery known, which has never been improved upon. The grease-spot photometer—in more general use for the measurement of artificial light than any other form of photometrical apparatus—is his. Yet the atmospheric burner and the grease-spot photometer were thrown off, so to speak, as little laboratory devices for facilitating work. Bunsen's heaviest labour was the systematizing of spectrum analysis, in which he collaborated with Kirchhoff. This important work was duly recognized by the Royal Society. His greatest productions, on the whole, were the brilliant army of scientific workers whose good fortune it was to study under him during the fifty-seven years of his tenure of the Chair of Experimental Chemistry at Heidleberg.

In Sir Edward Frankland, who also died within the past fortnight, England lost a man of science whose life-work was mainly devoted to the practical, sanitary applications of chemical science. Although of late years best known as the Government Water Analyst, and as one who staunchly upheld the truth about the purity of the London Water Supply against interested detraction, he was more than a mere analyst. His great book of "Experimental "Researches" is on every chemist's shelves, and shows that calorimetry, the combustion of gas, and other matters, occupied his attention. Still, Frankland will be mentioned by posterity most frequently as the chemist who happened to be available when the British Government set the example to other countries of subjecting the sources of the water supply of the country to precise scientific investigation. Frankland won his spurs by the famous Sixth Report of the Rivers Pollution Commission, the conclusions of which read strangely in the light of later knowledge. It is a testimony to the openness of Frankland's mind that quite late in his lifetime he accepted the bacteriological test for drinking water, which so profoundly modified the older conclusions of chemical science on the question of purity. We gave last week a full notice of Sir Edward Frankland's work; but it should also be mentioned here that he was the inventor of the double-chimney argand gas-burner, which is constantly popping up again in the shops. It is described in his book above alluded to, and is at least forty years old.

A Drawback of Democracy.

IN his thoughtful address to the Co-operators at the Crystal Palace last week, Mr. Gerald Balfour took the opportunity of mentioning what is unquestionably one of the drawbacks of the political system under which we now live. Speaking of co-operative trading and production as a particularly concrete example of the rule of Democracy over this country, Mr. Balfour laid stress upon the practical "difficulty of applying a democratic control to the modern "system of industry." He might likewise have said to the modern system of local self-government, which involves a good deal of production and trading. To all intents and purposes, a municipal government is, or should be, a co-operative business. This being so, what is the difficulty? Simply that where every individual worker or member of the community has his recognized share of the direction of the concern, he is apt to think that superior individual ability in management, calling for higher remuneration than he gets himself, can be dispensed with. The Co-operative Society, like the Municipal Corporation, supersedes the capitalist. It cannot dispense with the money-lender; but this astute personage has succeeded in attaching his recompense to the money itself—the capital—by the name of interest. It is thus relieved from the odium which socialistic doctrines have put upon the return on capital in other forms, as rent, royalty, or trade profit. Thus the money-lender who enables a town to buy its gas-works is able to hold out his hand, without shaking, for his interest when it becomes due; whereas if he were a mere shareholder expecting a dividend in a gas company, he would in all socialistic circles be cursed for his rapacity. When the Co-operative Society or the Municipal Corporation has got to work, the members do not see why anybody employed in the business, whatever it is, should fare better than another. "Jack is as good as his master;" and he means to act accordingly. He is not going to pay a black-coated gentleman a big salary for strolling to the office at ten and leaving at four, to say nothing of going off whenever he likes. So the ordinary member of a Co-operative Society or a truly democratic Municipality will have nothing to do with such gentry. He fully believes that the remuneration of intelligence, rectitude, and business ability on a scale suited to the magnitude of the interests at stake is a superstition of Capitalism. Hence he is not willing to pay for good management; and, in return, good managers fight shy of appointments where they are likely to be badgered by a set of men incapable of appreciating qualities of which they themselves are destitute. Did not the great John Burns once declare that no man was worth more than £500 a year? The fact that John Burns has since been sobered by seeing a London County Council appointment, carrying a salary of £2000 a year, going begging, does not touch those who still thoroughly believe in the principles which he has forsworn through force of circumstances. Recently in the democratic Town Council of West Ham, a Corporation official of blameless character was hounded out of office because the majority of the members entertained similar sentiments to those called in question by Mr. Balfour at the Crystal Palace. The nature of Democracy is equality; but the essence of administrative efficiency is the proportionate reward of merit, which is inequality. He is no true friend of Democracy who shrinks from telling its faults. Equality needs a Napoleon to fight its battles, and must be prepared to make it worth his while—having found him first, which is no easy matter. We have Democracy with us, for good and for evil; and the worthiest task remaining to be performed in constructive statesmanship is to reconcile its nature with its needs, and so eliminate its weaknesses.

WATER AND SANITARY AFFAIRS.

ALTHOUGH the subject of the weather is one which is generally contemptuously spoken of as serving only as an introduction to more agreeable topics of conversation, it is surely permissible, when the meteorological conditions have been extraordinary, to regard the matter with a little more seriousness. It is under some such conditions as those alluded to that the inhabitants of these islands have been living during the past three months. Since the close of the third week in May, there has been an almost uninterrupted continuity of fine warm weather, which has no doubt delighted people whose business in life is pleasure or farming, but has caused some anxiety to those who are responsible for keeping up the supply of water in our densely populated towns. The position is only another proof of the wisdom of much of the topsy-turvy philosophy of England's best-known librettist, who a few years ago directed our attention, in his inimitably humorous manner, to the diverse effects of the allocation of their gifts by the Fates. For unquestionably the pleasure-seeker is made happy while the water-supplier is not; yet no one will, we think, be prepared to say that, on the principle of the greatest good to the greatest number, the latter is a more worthy object than the former. At the same time, the farmer is also probably happy; and this affords some consolation. To come back, however, to the more serious side of the question, we have to consider the fact that during the past twelve weeks the dry weather has affected practically the entire country. Over the North of England and Scotland there has been a loss of 1½ to 3 inches of rain; while in the case of the rest of the kingdom there has been a very much larger deficiency. Many places in England have not had half their proper quantity; the Metropolis being the worst sufferer. In 23 days, London has been favoured with only an eighth of an inch of rain, or less than one-third of the normal amount; while in the Thames Valley the rain has fallen, on an average, only once a week. In the three months from May to July, the total rainfall was 3·05 inches; whereas in the corresponding period of 1898 it was 4·46 inches.

This being the position of affairs, it is surprising rather than otherwise that there has not been a greater outcry than we have heard about short supply of water. It is true that a few weeks ago, just at the time the London County Council were discussing the Water Question, attempts were made to get up a scare as to stoppage of the service at both the East and West ends of London. In the former case the report was practically a hoax, and in the latter it was absolutely untrue. Thanks to the intercommunication scheme, the East-end is receiving an ample supply of water; the East London Company sending into their district last month 46,600,000 gallons, as compared with 44,959,166 gallons in July, 1898. And seeing that the provision of the constant supply begets a tendency to an extravagant, not to say wasteful, use of water, it is creditable to the Water Companies to find, from the annual report of the Chief Officer of the Public Control Department of the London County Council—Mr. Alfred Spencer—that six of them are now giving a constant supply in those portions of the Administrative County of London which are within their respective areas. The other two Companies, however—the New River and the West Middlesex—have not yet abolished the intermittent service in the whole of their London districts. Here we may take a glance across the Channel, and see how our neighbours stand. A few days ago, according to the Paris Correspondent of the "Daily "Chronicle," circulars were issued to the householders warning them to economize the spring water, as, unless they did, a continuance of the dry weather would necessitate the turning on of Seine water for dietetic purposes. Happily the fears raised by these premonitions were somewhat allayed by the saving of about ten million gallons of water which was daily making its way through a hole discovered in the pipe conveying it from the River Vanne, instead of flowing into the reservoirs for the service of the city. The repair of the pipe has, fortunately for the inhabitants, rendered recourse to Seine water unnecessary. The Engineers of the Ponts et Chaussées (assuming they were responsible for the work) have acted upon an old maxim well known to their neighbours of the École de Médecine—they have removed the cause, and the effect has consequently ceased.

Coming back to our own country, there is undoubtedly great uneasiness in the Provinces. At Birmingham the reserve storage has been very much more largely drawn upon than it was this time last year. The exercise of economy on the part of the consumers is again enjoined, while the use of water for road purposes is restricted. Manchester has not a superabundance of water, yet the Corporation last Tuesday completed their undertaking to let Wigan have 200,000 gallons daily should the borough's resources fail—and they were being heavily drawn upon a few weeks ago, to the alarm of the Chairman of the Water Committee. His mind, however, is now, let us hope, at ease. At Bradford, the shortness of the supply on the high-level system has necessitated the whole of the city and out-townships being put upon an intermittent service; the water being shut off between 7 p.m. and 6 a.m. as from yesterday week. New works, which it was hoped would be well forward by this time, have been delayed owing to the difficulty experienced in getting castings. But for the prompt measures lately taken by Mr. James Watson, the Corporation Water Engineer, by which three million gallons of extra water were sent into the city, the reservoirs on the high-level service would have been dry. Bradford's action has given offence to Cleckheaton, inasmuch as the agreement between the two Corporations was for a constant supply. At Lancaster, the water has been turned off from 9 p.m. till 6 a.m. At Chesterfield, notice has been given of the intention to stop off the supply of water for trade purposes. Coming south, such a dearth of water as is now experienced in the hilly districts of East Kent has never been known. In South Wales, a serious condition of things obtains in the Rhondda Valley. At Clevedon, where upwards of 50 gallons per head per day have lately been used (or wasted), and elsewhere, very necessary caution has been given to the consumers to be as economical as possible; and at Bradford, it is thought that the Water Committee would not be doing their duty unless they added some "gentle compulsion" to that "moral appeal" against wilful waste which, though made regularly in such seasons as the present, never (in the words of a local paper) "seems seriously to touch the communal conscience." This is rather curious, as the parties alluded to are, as ratepayers, the owners of the undertaking; and therefore they should not stand in need of such admonition.

Apart from the necessity for checking extravagance and waste in every possible way in prolonged dry periods such as the one through which we have been passing, attention should be given to the advisability of providing adequate means for storing water when it comes in abundance. Unfortunately, this is a point which in some cases is not sufficiently considered. But surely it is not good policy to live from hand to mouth, so to speak, in a matter of this kind. Water-works, as an eminent Engineer told a Corporation the other day, should be at least five years in advance of the requirements—not "neck and neck." This storage question is now being forced upon the attention of a District Council in South Wales, whose area is suffering from the effects of the drought, while that of a neighbouring Water Company is being well supplied owing to the recent completion of a reservoir. The opening of the Burrator reservoir at Plymouth took place just in time to save the borough from a water famine. That the reservoir question is one of primary importance is evidenced by the fact that the Derwent scheme will shortly be commenced to assist some of the principal towns in the Midlands; and every month brings us nearer the accomplishment of the great undertaking at Staines which will add so materially to the efficiency of the London Water Supply.

Iron and Steel Institute.—The autumn meeting of this Institute was held in Manchester on Tuesday and Wednesday last week, under the presidency of Sir W. Roberts-Austen, K.C.B., F.R.S. Among the papers read was one by Major R. H. Mahon, R.A., who discussed the possibilities of manufacturing iron and steel at a profit in India; the neighbourhood of Calcutta being recommended as the most favourable site for works. The present position of the solution theory of carburized iron was communicated in a paper by Dr. A. Stansfield; and the relation between the structure of steel and its thermal and chemical treatment was dealt with by Mr. Albert Sauveur, of Boston (U.S.A.). There were several visits in connection with the meeting, and also a *conversazione* in the Town Hall, at which the Lord Mayor and Lady Mayoress held a reception.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 498.)

BUSINESS was decidedly quiet on the Stock Exchange last week especially in the earlier part, when the extreme heat of the weather indisposed to activity. The fact, too, of its being account week limited the amount of fresh business; and, as the Exchange was closed on Saturday, many of the members went away as soon as the business of the settlement was over. The tone at first was rather flat; but it improved later on as more hopeful views regarding the Transvaal situation prevailed. Consols recovered partially from their extreme depression; and prices in other departments show an improving tendency. The Money Market was quite firm; and there was a good demand in connection with the settlement. In the Gas Market, business was not very brisk—only what one might expect in mid-August; but there were a good many changes in quotation. The bulk of these arise from *ex div.* variations; and they are almost without exception in the upward direction. The one or two retrograde moves are attributable to special causes. In Gaslights, the ordinary opened firm, and changed hands at top price two or three times. It went better still without the dividend, and then continued to improve till it closed with a mark of 108¼ *ex div.* The secured issues also held very firm. South Metropolitan was only moderately dealt in, but came out fractionally better at the close. There was more activity in Commercials, at steady figures; but the quotations did not move. Very few transactions were recorded in the Suburban and Provincial Companies; but several quotations were advanced—Brentford and Crystal Palace leading the way. Brentford new was already standing rather high in proportion, so it could not participate in the fresh advance. The Continental Companies were quiet; and the only change was a slight fall in Union. Among the remoter undertakings, the only move was a drop in San Paulo. The Water Companies were almost quieter than ever; but movements in price took place. Kent and West Middlesex advanced; but East London was flat. The New River dividend is slightly lower—2s. 5d. per cent., to be exact; but the price was not affected.

The daily operations were: Business in gas was exceedingly quiet on Monday; but prices were steady, although British fell 1. In water, East London was 1 lower. There was rather more animation on Tuesday, coupled with firmness, and Brentford old rose 2. Wednesday was a brisker day, especially for Gaslight ordinary. Several quotations advanced *ex div.*, as per the list. In Water, Kent rose 2, and West Middlesex 2½. Things, fell back into quietness on Thursday. Union receded 2, and San Paulo ½. East London Water dropped 3. Friday was a better day; and Gaslight ordinary rose 1.

ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting of Marylebone—Pluralism Prevented—Ethics of the Matter—Electricity Embroiled with Labour at Sheffield.

THERE are several ways of looking at anything; and very much depends upon the point of view. It is probably, in the estimation of members of the profession, a happy fact that the complexity of our modern civilization tends ever to provide more work for the very clever gentlemen who earn their livelihood as surveyors and valuers. A striking illustration of the way in which business of this kind grows under the kindly influence of legislation is supplied by the electric lighting of Marylebone. It will be remembered that the Vestry of this Metropolitan parish thought they would like to do the electric lighting of the district, like their neighbours in St. Pancras and Hampstead. Before the Vestry arrived at this decision, however, the Metropolitan Electric Supply Company had begun operations in the parish, and had secured a valuable connection in some of the best streets. When the Vestry desired to go into the business, Parliament required them to buy out the Company on the good old principle that public money must not be used to compete with private capital. This order entailed the valuation for severance of the Marylebone portion of the Metropolitan Company's undertaking, which, as usual, was done for each side; and the result has just been published. The valuers for the Vestry have found that £319,735 is due to the Company in respect of capital expenditure, to which they add £305,283 for goodwill and some other items; making a total for the property of £643,580. On the other hand, the accountants to the Company, while agreeing as to the capital expenditure (which was taken from the books), estimate the goodwill value of the undertaking at £613,476, and make the total price amount to £933,211. The difference is therefore the neat little sum of £289,631. This, to the professional mind, must be highly satisfactory. It is a noble sum to arbitrate about; and will carry a good load of costs. The electricians grieve over their inability to get up a proper "day load" for their plant. The surveyors will show them how they can get up many a day's load over a job of this kind. The newspaper report, from which we obtain this information, concludes with the humorous remark that "the Vestry will consider the matter when they reassemble after the vacation." It is a pity that the holiday of these public-spirited vestrymen should be spoilt by thinking too much about the cost of a Progressive policy in matters of electric lighting.

News of a very curious development of electrical enterprise comes from Bradford. Gas managers know something about what is meant by the term "private practice," in connection with professional life under a company or a corporation; but it would not be in accordance with the advanced character of an electrical engineer's employment if he could not "go one better" than a mere gas man as regards this and all other concerns of his calling. Bradford has a "pioneer" electricity supply undertaking, which is under the immediate control of an Electrical Engineer who has made a high reputation in his profession. Bradford is accordingly credited with having made a very good thing out of its electric lighting, and this happy result is ascribed in a large measure to the circumstance of the undertaking being in good hands. It is a far cry from Bradford to Southend-on-Sea; but even so far has the fame of the Bradford City Electrical Engineer extended. Southend-on-Sea has an Electric Lighting Order which it did not quite know what to do with; and, by a happy inspiration, some Southender thought it a good idea to put it into the capable hands of the Bradford City Electrical Engineer. The gentleman seems to have been willing. He even saw his way to form a Company to work the Southend business according to his plan; but before the affair could be concluded, Bradford got wind of it, and promptly drew the line at a Corporation official's transfer of a portion of his interest in electricity to the coast of Essex. It was made a Council matter; but the Electric Lighting Committee were beforehand with the complaint, and were able to announce that their Engineer, on their representations, had given up the new undertaking.

This is as it should be. The question of the right of a paid permanent official to take outside work has always been a vexed one; and this is no place to open it up generally. Of late years it has become the custom, when head officers of considerable undertakings, or the chiefs of municipal departments, are engaged, to stipulate that they shall devote their whole time to the duties of their post, and (in some cases) pay over to their employers all fees they may receive as expert witnesses, and so forth. Without specifically referring to the conditions of employment under the Bradford Corporation, or to this abortive Bradford-Southend combination, it does seem reasonable that electricians in corporation employ should be content therewith, and not take work that others could do as well as they. Half the Electric Lighting Orders belonging to British local authorities can never pay to work; but this is no reason why the holders should run after successful or well-advertised officials of other local authorities for assistance in working them. A consulting engineer who owns allegiance to none but those who employ him from time to time may, of course, work any number of commissions at once; but a salaried officer should not be a pluralist.

Reference was made in the "JOURNAL" last week to the labour troubles of Sheffield. A tremendous fuss has been raised there over the proposed purchase of some electrical machinery from the well-known firm of Ferranti, because they decline to be bound by the "fair contract" which it has become the rule to insert in the Corporation contracts. It appears that there has been no difficulty over this clause ever since it was adopted by the Sheffield Corporation—probably because the question never arose in connection with purchases of commodities that were not proprietary articles. The time came, however, when Sheffield wanted some Ferranti specialities; and the firm refused to accept the purchasers' dictation as to how they should carry on their business. It consequently became a test question—Ferranti speciality against labour politics. The interests of the city had nothing to do with the issue. The labour politicians of the Sheffield City Council tried to shut out the Ferranti machines because the local Trade Unions told them to; and it is a happy chance that they failed. It was a close thing—26 against 23; but the Electric Light Committee carried their point. It will be a curious coincidence if anything should happen to the plant after the new additions have been made. Query—is Charles Reade's "Put Yourself in His Place" in the Sheffield Public Libraries?

A National Physical Laboratory.—The report of the Committee appointed by the Treasury to consider the desirability of establishing a National Physical Laboratory has lately been issued. The conclusions arrived at are: (1) That a public institution should be founded for standardizing and verifying instruments for testing materials, and for the determination of physical constants; (2) that the institution should be established by extending the Kew Observatory in the Old Deer Park, Richmond, and that the scheme should include the improvement of the existing buildings and the erection of new buildings at some distance from the present Observatory; (3) that the Royal Society should be invited to control the proposed institution, and to nominate a governing body on which commercial interests should be represented, the choice of the members of such body not being confined to fellows of the Society; (4) that the Permanent Secretary of the Board of Trade should be an *ex officio* member of the governing body, and that such body should be consulted by the Standards Office and the Electrical Standardizing Department of the Board of Trade upon difficult questions that may arise from time to time or as to proposed modifications or developments.

WORKMEN'S COMPENSATION AND OLD-AGE PENSIONS IN FRANCE.

II.—Old-Age Pensions.

It has been frequently remarked that the question of providing pensions for the aged poor is coming to be very generally associated with that of workmen's compensation; the association being due to the belief that the tendency of employers to prefer young and active workmen to those handicapped by advancing years, is growing in proportion as the liability imposed upon employers in respect of accidental injuries to their men increases. It is a moot question whether the young and reckless man does not often run more risks in the course of dangerous work than the older and more experienced mechanic; but it is suggested that the fact that the compensation payable on the accidental death of a single man is a mere nothing compared with the indemnity to which the widow or orphans of a married man are entitled, may lead some employers to discharge, or refuse to employ, men of mature age. When, however, it is borne in mind that the English workman generally marries, and marries young, this suggestion appears to have little foundation. Indeed, we find it difficult to believe that any serious ground at present exists for the allegation that the compensation laws are driving elderly men out of employment. It is easy enough to organize a Hyde Park demonstration of men who declare that they have found themselves "too old at forty" to obtain work; the probabilities being that they are debarred by incompetency or laziness rather than by age. But demonstrations, like statistics, may be made to prove anything; and it is obvious that so long, at any rate, as the volume of work to be done in this country continues to bear its present relation to the population, it will be necessary, in the future as in the past, to employ all generations of labouring men. When the inevitable "slump" succeeds the present "boom" in trade, the hard cases, which at present exist mainly in theory, of the fully capable but elderly men who find themselves shunted in favour of the younger generation may raise a serious question, and add a further element of difficulty to the problem—as perennial as, because consequent upon, periods of trade depression—of how to deal with the unemployed.

But be the facts and probabilities what they may, it is undoubtedly the case that the cry of "too old at forty," coupled with some isolated and over-emphasized instances of employers (frightened, shall we say, by the "compensation bogey") refusing work to elderly men, has given renewed impetus to the agitation for Old-Age Pensions. It may be observed in this connection that the quarter-of-a-century intervening between the age at which it is suggested that employment is difficult or impossible to find, and the earliest age (65) at which, under most of the many schemes advocated, it is proposed that pensions should be granted, leads one to think that the proposed remedy is scarcely calculated to meet the alleged evil. Even if there be anything in the contention that the Workmen's Compensation Act will operate to the detriment of elderly workmen, it is obvious that the prospect of a pension at sixty-five will not fill the stomach of an out-of-work aged fifty-five.

In view of this constant, if possibly mistaken, association of the question of providing for the aged with that of compensating the injured, we, having previously explained the provisions of the French Workmen's Compensation Act, think it may be of interest if we proceed to give some account of the steps that have been taken, or are being contemplated, in France in the direction of finding the way out of the difficulty of how to deal with the aged deserving poor—the main source of our information on the subject being an article by Mr. Arthur F. Wood in the July number of the "Nineteenth Century."

In France, as in England, it is the case that, whereas the agitation in favour of adequate compensation for the injured workman has resulted in legislation on a large and generous scale, the question of Old-Age Pensions—so far at any rate as any comprehensive scheme of State-granted or State-organized pensions is concerned—has not got beyond the stage of proposition and discussion. But much more has been done in France than in this country to encourage and, in some cases, to assist individual effort to provide for the necessities of old age. In that country such provision can be made through an institution (somewhat resembling, but more extended in its scope, because more elastic than, the Annuity Department of the English Post Office) known as the *Caisse Nationale des Retraites pour la Vieillesse*, which, as we have seen, is utilized in the carrying-out of the French Workmen's Compensation Act. The *Caisse* was established by law in 1850, for the purpose of encouraging thrift and forethought among the poorer classes. Frequent amendments in its constitution were made during the Empire; one of the most important being that whereby membership was made obligatory upon all Government employees. The law which, with some slight subsequent modifications, at present regulates the *Caisse* is that of the 20th of July, 1886. The minimum annual deposit is fixed at 1 fr.; the maximum at 500 frs. (say £20); while the maximum pension is 1200 frs. (about £48). The rate of interest allowed on deposits is not unchanging as is the case with our Savings Bank rate. It is upon a sliding-scale, fixed annually in accordance with current rates. At present it is, and has for some years been, 3½ per cent. Deposits may be made through tax-collectors or the post offices. Every deposit gives a right to a pension; cessation or irregularity of deposits not involving any forfeiture of previously acquired rights. [This strikes one as an admirable arrangement. Many English people hesitate to insure an annuity for fear of some unforeseen contingency preventing them from maintaining their premium payments.] Provision can be made to ensure the annuity at such age (after fifty) as may be desired; the amount, of course, varying with the age at which the annuity commences. Should a depositor become permanently incapacitated before attaining the age of fifty, he may claim to receive such pension as his age and payments may entitle him to receive; and an addition is made thereto by a Government grant, if the Commissioners of the *Caisse* so recommend. No pension under 300 frs. (say 5s. per week) can be alienated or attached for debt.

The result of the operations of the *Caisse* has, we are told, been considered unsatisfactory. The depositors now number only some 800,000, out of a population estimated to include 12,000,000 working men; and of these depositors the greater number join from compulsion, not from choice. It should, however, be mentioned that in France the *Sociétés de Secours Mutuels* (corresponding to our Friendly Societies) not only, in many cases, provide for the old-age of their members, but are subsidized by the Government in respect of such superannuated members. But the number of members belonging to such societies does not exceed a million-and-a-half. The partial success of the *Caisse*, however, compares most favourably with the practical failure of the Post Office Annuity system in this country; but it is nevertheless obvious that the existing system in France only touches the fringe of the problem of maintaining the labouring classes in their old age. This fact is fully recognized in France; and, during the past decade or more, many schemes have been propounded for the reorganization or supersession of the *Caisse*.

The most reasonable and practicable of these schemes were referred—together with a Government measure introduced in 1891, known as the *Projet Constans*—to a Commission of Labour appointed to consider the whole question. This Commission, which reported in 1893, rejected each and all of the schemes submitted to it, and finally produced a plan of its own. It is interesting to observe that the progress of the discussion on the second subject of our article, as of that on the first, has followed on somewhat similar lines on either side of the Channel. The scheme propounded by the Commission was to maintain the institution of the *Caisse* (to be known in future, however, as the *Caisse de Prévoyance*), to leave membership thereof as voluntary as before, but to supplement the contributions of the depositors by a Government grant equal to the amounts deposited, and by compulsory contributions from employers equal to those of their workmen, subject to a maximum of 9 frs. per workman per 300 working days. As at present, an equivalent pension was to accrue from the smallest deposit; the maximum deposit being fixed at 30 frs. per annum and the maximum pension at 600 frs. (rather less than 10s. per week). Elastic arrangements were suggested for the payment of deposits—directly or indirectly (through Friendly Societies, &c.), and by money or by stamps.

The Commission further proposed that the premiums should be invested by the *Caisse* so soon as paid; and, to obviate the difficulty—involved in every large scheme of deferred annuities—of finding in the future sufficient Government securities for the investment of the necessarily vast accumulation of capital without unduly lowering the rate of interest receivable thereon, they suggested that the funds should be employed for their "proper object"—namely, in the promotion of trade; and that "instead of being a dead-weight burdening the market, the capital should be made living and fruitful, increasing the prosperity of the country and of the mass of its citizens." This proposed speculation with such funds has been the object of much well-deserved criticism in France. We say well-deserved, because the underlying idea is absolutely fallacious, and the proposal amounts to nothing less than substituting less for more sound securities to achieve an object already attained. That idea is that money invested in Government securities is in some mysterious way rendered unavailable for use in commerce; and the end sought is to release this supposed dead capital for the benefit of the community. But when a Government buys Government securities, what does the seller of those securities do with the money he receives in exchange for his script? He does not bury it in a napkin, like the unprofitable servant, but returns it to the community's stock of available capital by investing it elsewhere. The fact is, of course, that all money that is not actually hoarded is (however invested) being used for the benefit or development of the country. The Commission's suggested plan would, then, if adopted merely shift the risk of commercial speculation from the present holder and hypothetical seller of Government securities on to the shoulders of the working-men depositors in the *Caisse*. Moreover, the belief that extensive purchases by a Government of its own securities tends greatly to increase the price of, and therefore to decrease the rate of interest received on money invested in, those securities, is not entirely justified. Some slight tendency in that direction does, of course, result; but the price of Government stocks depends, apart from political influences, almost entirely on the scarcity or otherwise of money in the market. The present high price of Consols is mainly due to the increasing accumulation of wealth in this country, not to the purchases of the National Debt Commissioners.

The cost to the State of the Labour Commission's scheme is estimated to vary from one million francs (about £40,000) in the first year up to 27½ millions (or £1,100,000) in the thirty-first year and thereafter. The principal alternative scheme to this of the Labour Commission is that brought forward by the Socialists. They propose that each member should contribute 12 frs. per annum; the employer (in the case of a workman) 18 frs.; and the State 33·50 frs. per annum. Every member would receive a pension of 500 frs. if married, or 400 frs. if unmarried, at the age of sixty, besides free medical attendance and 1·50 frs. per day if sick. If totally incapacitated before sixty years of age, the member would at once receive his full pension. If he should die before that age, his widow would be granted half the pension. Anyone possessing an assured income of 1000 frs. would be excluded from membership; and anyone with an assured income of less than 1000 frs. would only receive such pension as should assure an aggregate income of that amount. The total annual charge upon the State is estimated at the figure of 358 million francs, or say 14 millions sterling (as against Mr. Booth's estimate of 17 millions for his scheme of a universal 5s. pension); and it is proposed to make this an annual charge on the budget—to be met out of an income-tax, a succession duty, a contribution from the *Pari Mutuel*, and a gradual conversion of the National Debt from three-and-a-half into two per cents.

Such then are the essential details of the two chief proposals now before the public in France. The result of the discussion thereon cannot fail to be of much interest to all students of the subject, the difficulties of which certainly do not lessen when it is sought to supersede rhetoric by legislation. We note that Mr. Wood takes the same view of the probable undesirable effect of State-aided pensions upon the character of the working classes as that advanced by the Quarterly Reviewer, whose article thereon we recently noticed.

PROFESSOR BUNSEN.

When mentioning in the "Journal" last week, the acknowledgment by the late Sir Edward Frankland, of his indebtedness to his "friend and teacher" Bunsen for the inculcation of principles which were of immense value to him in his scientific investigations, we did not think it would be our painful duty to record to-day the removal of the eminent Chemist whose name has been before the world for the greater part of the present century. Professor Robert Wilhelm Bunsen died last Tuesday morning at Heidelberg, where the latter years of his long and useful life—devoted to science—were passed in retirement. It may be remembered that in May last, as notified in our columns at the time, Professor Bunsen was attacked by serious illness, from which it was thought scarcely possible he could recover. But he seems to have rallied, and retained his faculties to the end. By his death the last of the great German pioneer chemists has been taken away; but the fruits of his teaching will live for ever.

Professor Bunsen was born at Göttingen on March 31, 1811, and received his early training at the University in his native town, where he took the degree of Ph.D. in 1831. After spending a few years in Paris, Berlin, and Vienna, he in 1836 succeeded Wöhler as Professor of Chemistry in the Polytechnic School at Cassel. Two years later he went to Marburg, where Frankland and Tyndall came under his influence. In the University there he filled the positions of Assistant-Professor and Professor; and he subsequently became Director of the Chemical Institute. In 1851 he removed to the University of Breslau; and in the following year he was appointed to the Chair of Experimental Chemistry at Heidelberg, where he remained, notwithstanding a tempting invitation he received to go to Berlin, until his resignation in 1889. His abilities were recognized in other countries than his own—England not being by any means backward in this respect. In 1858, the Royal Society elected him one of their foreign members, awarded him the Copley Medal in 1860, and in 1877 selected him and his colleague Kirchhoff as the joint first recipients of the newly instituted Davy Medal.

It was in the University of his native town that Bunsen first showed his ability as an investigator; and the result of his assiduity was a large number of important discoveries in almost every branch of chemistry. While at Göttingen, prosecuting some researches on arsenical compounds, he met with an accident which deprived him of the sight of one eye, and nearly cost him his life. He, however, pursued his work until he succeeded in placing the chemistry of the whole subject in a clear light. He then took up the chemistry of the blast-furnace, which led to the discovery of accurate methods of gas analysis. Next came the construction of the Bunsen battery, which supplanted the more expensive one of Grove, and was generally employed as the cheapest means of producing electricity until its displacement by the dynamo. After this came a series of researches on various metals, chiefly by the aid of electricity; among them being the separation of the rare earths yttria and erbia, about which so much has been heard during the past ten years in connection with the manufacture of mantles for incandescent gas lighting. And here must be noticed the other important feature of that system of lighting—the Bunsen burner, which is now of universal application for every purpose where a clean flame is required. Referring to this appliance in their notice of the life-work of the great Heidelberg chemist, "The Times" alluded to the fact that "no one before Bunsen had thought that a mixture of coal gas and air could be made to burn without explosion from a simple tube burner. His clear conception of the laws which apply to the inflammation of such a mixture showed him that it was possible to arrange the dimensions in such a way that a steady, smokeless, and highly combustible mixture could be obtained; but a long series of delicate experiments was needed before the perfect burner which now bears his name resulted."

Probably the most important work of Bunsen's life was that in which he was associated with Kirchhoff, and which led to the discovery of spectrum analysis. "The Times" thus appreciates this valuable scientific achievement: "To have added a new branch to chemical science which throws a clear and wholly unexpected light upon the constitution of terrestrial matter, which has been the means of discovering many new chemical elements, and of proving the widespread distribution of others hitherto considered as rare, would, in itself, have been a work of primary significance; but when to that is added the fact that by means of this far-reaching method the bounds of our planet are outstepped, and a knowledge not only of the chemical composition of the sun and of the far-distant stars, but even of their rates of motion, has thus been obtained, an idea may be formed of the debt of gratitude which all interested in human progress must feel to the two great twin brethren who in their quiet laboratory at Heidelberg revealed such hidden secrets." Among Bunsen's other labours of value to the chemist and physicist may be mentioned his researches in physical chemistry, on the measurement of the chemical action of light, on the determination of specific heat, and on the composition of volcanic rocks. Of course, his name will be best remembered by those interested in the supply of gas by his burner and photometer. Reference has already been made to the former; and with regard to the latter it is sufficient to remind our readers that in its production he was associated with Mr. Alfred King, of Liverpool. It differed from all photometers which had been previously constructed, in this respect—that it effected the estimation of comparative intensities by transmitted and reflected light conjointly, instead of, as before, by one of these agencies alone. The original form of the photometer, as is well known, has been considerably modified—notably by Dr. Letheby and Mr. F. J. Evans.

It only remains to allude briefly to Bunsen's work as a teacher. He was passionately devoted to his laboratory and to his students; and his lectures were original and most instructive. But, as "The Times" points out, it was in the patient teaching in the laboratory that his genius showed itself strongest; and the pupils from all parts of the world who were fortunate enough to work under him in his most prolific days in Heidelberg all conceived for him the deepest feelings of respect and affection, his precept and example having influenced their whole lives. It was his special ability as a teacher that was so warmly acknowledged by his pupil Frankland, as already mentioned. His presence was always welcomed in the academic circles of his University, for his simple and original nature; and among his academic colleagues no one was honoured as he. Orders and decorations from all parts were bestowed upon him; but these he valued less than the recognition by his brother men of science of the work he had done.

OBITUARY.

The death is announced of Mr. John Philp, who was for a number of years Chairman of the Lostwithiel Gas Company. Deceased was in his 84th year.

We regret to announce the death, on the 12th inst., of Mr. Arthur Rhodes, Deputy-Manager of the Gaythorn station of the Manchester Corporation Gas Department. Deceased had been suffering from a growth in the neck, which unhappily gradually affected the brain. The funeral took place last Wednesday.

The Hexham Gas Company have recently sustained a great loss by the death of their Chairman, Dr. Stainthorpe, who for the long period of 41 years occupied a seat on the Board. At the last meeting of the Directors, they passed a resolution expressive of their regret at this sad event, and acknowledging the valuable services rendered to the Company by the deceased. A copy has been sent to Dr. Stainthorpe's family.

The Royal Commission on Water Supply has been deprived of one of its members by the death, on Monday last week, at his residence, Beechwood, near Marlow, of Mr. Henry William Cripps, Q.C. Deceased, who had not been very well for the past few months, although he was able to attend the concluding sittings of the Commission, was some years ago a leader at the Parliamentary Bar; and his sons are members of the profession. Mr. H. L. Cripps is Parliamentary Agent of the London County Council, and Mr. C. A. Cripps, Q.C., M.P., a familiar figure in the Committee-rooms. He was called to the Bar at the Middle Temple in 1840, became a Bencher in 1866 (in which year he took silk), and was Recorder of Lichfield from 1852. He was also Chairman of the Bucks Quarter Sessions, and Chancellor of the Diocese of Oxford. On the formation of the first County Council in Buckinghamshire, he was unanimously elected Chairman; and he only recently resigned the position of Alderman.

PERSONAL.

Mr. DIXON PRATT has been elected Chairman of the Hexham Gas Company, in succession to the late Dr. Stainthorpe, whose death is recorded elsewhere.

Mr. J. HARGER PYE, formerly Engineer and Manager of the Barbados Gas Company, has been appointed Manager of the Clevedon Gas Company, and will commence his duties on the 15th prox.

The vacant managership of the Mossley Gas-Works, consequent upon the appointment of Mr. F. W. Johnston as Resident Superintendent of the Swan Village station of the Birmingham Corporation, has been conferred upon Mr. H. J. ROBINSON, of Stockport. There were 55 applications for the position, which were invited in the "JOURNAL" for the 1st inst. These were reduced to five. The successful candidate has been connected with the Gas Department of Stockport since 1884, and has been Assistant for the past eight years.

NOTES.

The Westinghouse Gas-Engine.

The Westinghouse gas-engines, which have been so much talked about of late, have been installed in a building at Chelsea, where they can be shown at work generating electricity on a fairly large scale. The plant comprises in all five gas-engines and dynamos, according to a description given by the "Engineer," ranging from 10 to 150 horse power. The latter motor is directly connected to a dynamo bolted to the same bed-plate. As a display of its governing capabilities, the 150-horse engine was running at 240 revolutions per minute, and was thrown off and on suddenly. In these circumstances, the engine did not "race;" the effect on the voltage of the dynamo being very small. The same performance with one of the smaller engines gave similar results. The appearance of the Westinghouse gas-engine is very like that of an ordinary steam-engine. In the larger sizes there are three inverted boxed-in cylinders. The proportions of the supply of gas and air can be varied at will by means of small hand levers provided with a dial and pointers which show with what mixture the engine is working. The governor, which consists of a vertical shaft with a ball governor, is described as playing the part of a proportional meter; preserving the proportions between the gas and air, whether the engine is running empty or at full load. An interesting point is the method of ignition, which is electric; being contrived by a small dynamo run off the engine shafting. These engines are described as running well, with small noise and little vibration. They keep the lights steady; but nothing is stated about the consumption of gas per horse power.

The Cause of the Hissing of the Electric Arc.

An extraordinary illustration of perseverance in a difficult line of research is afforded by Mrs. Ayrton's labours to ascertain the cause of the hissing of the electric arc. Further work in the same direction, by Miss Hertha Ayrton, has been described in "Nature." The author remarks that hissing is one of the few phenomena connected with the electric arc with which every one is familiar. Formerly, the sudden extinction of the light of an arc lamp, with the loud hiss accompanying its re-lighting, were regarded as being part and parcel of the performance. With modern arc lamps these little interludes are of less frequent occurrence; but still they do happen occasionally, and there is as much interest as ever in hunting out the reason. Arc lights both hum and hiss. The hum is a distinct musical note, which is often quite low to start with, and gets gradually higher until it is a shriek, and then the arc hisses like the discharge from a steam-pipe. It is very interesting to follow the observations that led to the discovery that when the arc hisses the crater has not only covered the end of the carbon, but gone some way up the side. The side crater is the cause of the hissing, from which it follows that a carbon will only silently carry such a current as will content itself with an end crater. But why does the side crater hiss? Because then the molten carbon is exposed to the air, where it burns with a green light. End arcs exist in a protecting atmosphere of carbon vapour. Ample experimental proof was obtained to show that the direct contact of the oxygen of the air with the crater of the positive carbon is capable of producing not only the fall of electric pressure between the carbons of the arc which is the most striking accompaniment of hissing, but also every other important manifestation connected with it, including the sound itself.

The Gas Tramcar.

The gas tramcar has made its appearance again, in the columns of the "Engineer." These cars, of the larger and more powerful pattern demanded by modern tramway requirements, are stated to be working continuously at Blackpool, and at Trafford Park, Manchester. The new pattern cars were made at Lancaster. They seat 52 passengers and have engines of 14 brake horse power. The gas is carried in three receivers, charged to a pressure of 10 atmospheres; the process of charging a car taking about a minute. The pressure at the outlet is controlled by regulators similar in design to those used for railway carriage lighting; so that the pressure to the engine remains constant. The cooling water is carried in a coil between the double roof, and needs renewing after a run of 30 miles in winter and 12 miles in summer. The consumption of gas amounts to about 34 cubic feet per car-mile, including that used by the compressing-engines at the depôt. The net gas consumption per car-mile is 30 cubic feet. The cost of traction, including all running expenses, works out at Blackpool to a fraction over 3¾d. per car-mile. The old objection to the odour of the gas-engine is stated to have been overcome by an improvement of the method of lubrication, which gets rid of the smell of half-burnt oil. Vibration has been reduced by the improved balancing of the engine, and is now less than that caused by passengers moving about the car. The question of speed is purely a matter of gearing—the present cars being run at eight miles an hour, which is the maximum allowed by the Board of Trade. It is remarked that if the restriction as to speed is relaxed, to oblige the partisans of electric traction, the gas cars can be speeded up with equal facility. Some extra heavy cars for French lines, with power up to 50 brake horse, are in preparation.

Samuel Clegg and the Atmospheric Railway.

Those students of the applied sciences who believe that there is much to be learnt from the failures of eminent practitioners, will be interested in the paper on the South Devon Atmospheric Railway presented by Sir Frederick Bramwell to the Institution of Mechanical Engineers at Plymouth. This was a sympathetic account of the greatest disappointment connected with the names of Samuel Clegg and the younger Brunel. Clegg left gas engineering for "atmospheric" railway engineering in 1830; and his idea that railway locomotion could be effected by means of a vacuum tube and travelling piston was approved by Brunel for the South Devon line, and passed by a Parliamentary Committee in 1845. The exhaustion of the tube was effected by stationary steam-engines at intervals of about three miles. The system was completed and worked, with much difficulty, between Exeter and Totnes for about four years. Its essential feature consisted in the vacuum tube, which ran all the way on the sleepers between the rails, and had a continuous slit on the top covered by a strip of greased leather. The tube employed was 13 inches in diameter; and the vacuum when pretty good was such as to afford an atmospheric pressure on the piston of from 8 to 10 lbs. per square inch. This amounted to a pull of about 12 cwt., which was quite enough for the work. The travelling was most luxurious. The failure of the system was due to the low efficiency of the vacuum pumping—865-horse power being required to do the work of 300-horse power on the train—but more particularly to the difficulty of covering the slit with something that would readily yield to the passage of the arm connecting the piston with the train, and would yet make an effective joint immediately after the passage of the piston. In the discussion on the paper, Mr. Henry Davey stated that Murdoch himself had worked with compressed air; having designed a workshop installation on the system for Boulton and Watt, in 1830. The personal connection between gas and air engineering, therefore, goes back to the early masters.

Research Fellowships of the City and Guilds of London Institute.—The Research Fellowships founded by the Salters' Company and the Leathersellers' Company for the encouragement of higher research in chemistry in its relation to manufactures, tenable at the City and Guilds Central Technical College, being now vacant, the Executive Committee of the City and Guilds of London Institute will, before the commencement of next session, consider applications and elect candidates. The grant made by each of the Companies to the Institute for this purpose is £150 a year. Copies of the schemes under which the Fellowships will be awarded may be had from the Hon. Secretary of the Institute, Gresham College, Basinghall Street, E.C.

Underground Temperature and Spontaneous Fires in Coal.—Dr. J. S. Haldane, F.R.S., and Mr. F. G. Meachem have collaborated in the production of a paper for the Institution of Mining Engineers, containing observations on the relation of underground temperature and spontaneous fires in coal to oxidation and to the causes favouring it. The investigations which the authors have conducted have led them, according to "Nature," to the following conclusions: (1) A very large amount of heat, often sufficient, if not otherwise absorbed, to heat the air current to boiling-point, is always being formed in a mine; and this heat is almost entirely produced by oxidation of material in the mine. (2) The heat formed greatly exceeds in amount, as a rule, the heat withdrawn by the air current; so that the temperature of the mine, or of some parts of it, is above that of the strata. (3) The disappearance of oxygen and the liberation of heat in the mine are probably due—largely, at least—to oxidation of iron pyrites; and the liberation of carbonic acid in the mine is probably due to the action on carbonates of the sulphuric acid thus formed. (4) Coal, when exposed to the air, absorbs oxygen, and may also give off carbonic acid and fire-damp, and a very small amount of carbonic oxide. (5) The rate of absorption of oxygen by coal varies directly with the proportion of oxygen present in the air; and as the temperature of the coal increases in arithmetical progression, the rate of oxygen absorption increases in geometrical progression.

COMMUNICATED ARTICLE.

DIFFERENTIAL RATES AS BETWEEN CONSUMERS OF GAS FOR LIGHTING AND FOR PURPOSES OTHER THAN LIGHTING.

By A Gas Engineer.

The paper under the above title read at the recent Gas Institute meeting by Mr. Thomas Newbigging, naturally attracted a vigorous discussion. Or, perhaps, I should say that the title attracted a discussion; seeing that most of the speakers gave results from their practice in the matter, and did not touch upon the propositions laid down by Mr. Newbigging—viz., that differential rates are an injustice, and that they will injure the gas industry—or upon the assumptions by which this opinion was supported. Many of the last named are decidedly out of accord with the views which have found general acceptance in the gas industry, and as such seem to call for a few remarks. In making these, I desire to avoid a partisan spirit, or anything in the way of taking up the cudgels on behalf of the opposite point of view to that adopted in the paper, and to look at the subject in a broad and independent manner as regards all the interests concerned—admitting that the gas-for-lighting consumer is entitled to fair and just treatment, but also bearing in mind that this should extend to all classes of customers, and to the shareholders also.

Before proceeding further, I should like to congratulate Mr. Newbigging on occupying a unique position, in a general way, as a voluntary advocate on behalf of the gas-for-lighting consumer. Modern ideas of trade do not extend far beyond selling in the dearest and buying in the cheapest market, competition to the death, and so on; and they leave but little room for abstract principles of justice or fairness as between one customer and another. One need not go beyond the supply of ordinary everyday commodities, to find examples of differential rates that are far in excess of the modest limits practised in the gas industry. Not to go outside our own tracks, I need only instance the coke trade as carried on by some of our largest undertakings, and would suggest that next year Mr. Newbigging should review it from a similar standpoint. But the matter now in view is that the paper and the tone adopted by several speakers in it advocating fairness and justice towards the consumers, find no parallel in any other industry. One may go further, and claim that this feeling is, and always has been, very widely disseminated among managers and directors of gas undertakings, and thoroughly permeates the business—even including the erring 87 who are referred to, more in sorrow than in anger. A claim that the gas industry occupies a very high moral platform in the world of commerce, would probably be received with public derision. But who can instance an example of a tradesman advocating even prices and even profits to all classes of customers; of a railway director who exerts himself on behalf of fixed mileage rates to all parties alike, whether for passenger or goods traffic; or of anyone who comes forward from the selling side of the counter to advocate justice for the customer who pays the tip-top price?

The term "cost price" is used in a different sense to its ordinary acceptation. The statement that some gas companies are selling gas at even less than cost is surprising, until we find by reading further that Mr. Newbigging includes maximum dividends and interest in the "cost price." On this basis, we can understand how it is possible to sell at a loss and yet make a profit. Any gas company not able to pay maximum dividends is "losing money," and may go on for years selling "at a loss" and yet earning 8 or 9 per cent. profit. To make the parallel good, we must assume that the old lady who bought eggs at 6d. per dozen received a fair trade discount—say, 25 per cent.—on the price. She would then be in the same position as a gas company who do not quite earn the full dividend allowed by their Act of Parliament. She would not have the full trade profit, but still might make a fairly decent living by selling the eggs at 13 for 6d. Again, suppose a commission agent is accustomed to make 5 per cent. on certain transactions. On some of these he finds himself unable to earn more than 4 per cent. According to Mr. Newbigging, he is losing 1 per cent., and "exemplifying his ability to live by his losses." In speaking of "cost price," it is usually understood that all appropriations for profit are excluded, and the actual expenditure for materials and labour alone considered. It is the total on the expenditure side of the revenue account, *exclusive* of the balance carried to profit and loss. This balance usually amounts to 25 or 30 per cent. of the total receipts; and in the case of a gas company selling gas at 3s. per 1000 cubic feet, it would amount to 9d. or more per 1000 cubic feet of gas. Let us suppose that 2s. 3d. represents the cost price as popularly understood, and 9d. the sum required for maximum dividends and interest. Mr. Newbigging claims that 3s. is the cost price, and that a special offer of 2s. 9d. or 2s. 6d. would be a case of selling 12 cubic feet at the prime cost of 13. But the view taken by those who advocate differential rates is that the prime cost is 2s. 3d., and that a special offer may induce a class of business that could not be otherwise obtained, the profits on which would not be less than those on the ordinary 3s. rate. This point will be followed out in more detail as I proceed; merely remarking for the present that, while Mr. Newbigging contends that the sale of gas at 2s. 9d. or 2s. 6d. must mean a loss or deficit that must be made up by picking the pockets of those who pay 3s., it is quite possible that the 2s. 6d. or 2s. 9d. gas may be furnished under circumstances that still leave the 9d. available for dividend—in other words, that the 3d. or 6d. is met by an economy in working expenses, and does not touch the 3s. consumer at all.

We are also given to understand that in the United Kingdom there are 57 boards of gas directors and 30 gas committees who are either not so well informed as they should be as to the proper methods of conducting their business, or have been reduced by the immoral influences of the differential rate into intentionally favouring their friends at the expense of the remainder of the customers, and therefore stand in need of a periodical reminder that "honesty is the best policy"—a reminder, by the way, that never did any harm. No doubt there are "guinea pigs" and self-servers among gas directors; but I venture to think they are the exception, and that the majority of the 87 are endeavouring to conduct their business efficiently, and are as anxious to deal fairly with their customers as the average "one price" man. Mr. Newbigging to some extent gives his case away in granting that circumstances arise which justify differential rates. He admits the justice of a discount to large consumers; he thinks that the public lighting authorities are entitled to some consideration on account of their 3800 hours per annum schedule; and on a previous occasion he has advocated a lower price to a customer close to the gas-works, as compared with one in an outlying district, when the works belong to a local authority. But he regards differentiation according to the purpose for which gas is to be used as absurd and wrong. Yet many of the arguments in favour of the large consumer, the long-period consumer, or the central consumer are applicable to the differential price question as regards various purposes for which gas is used.

The first article in the one-price-for-all-purposes creed is the assumption that the expenditure varies *pro ratâ* per 1000 cubic feet of gas manufactured, and that if the production doubles, the expenditure also doubles. But it is well known that it varies according to many factors, and not one; and that some of the items are entirely independent of the quantity of gas sold. Certain expenses have to be met if no business is done. Others vary per consumer, per meter, or per mile of main, or according to the profits. So the exact cost of each consumer is not a fixed quantity, but a complicated variable, depending not on the simple proportion of number of consumers to the total expenditure, or the personal consumption to the total consumption, but on the quantity used, the number of hours during which it is used, the maximum rate of consumption in regard to the general maximum rate, the distance from the works, and many other variables. These conditions fluctuate so much that probably no two consumers are alike, in the matter of cost price; and therefore the large consumer helps to pay for the small, and the all-the-year-round for the winter customer. The consumers close to the works, and in the centre of the district, help to pay interest on the spider legs that stretch out, perhaps three or four miles, for the supply of outlying districts. Not only is each consumer a variable quantity in the matter of cost as compared to others, but he is a changing variable. Even if his own demand is regular, the cost of serving him is influenced by the action of others. A customer may take 100,000 cubic feet of gas per annum regularly, but the cost of serving him may be affected by increases or decreases in the general or total consumption. If it falls 20 per cent., the cost of serving him will be increased; and if it rises 20 per cent., the cost will be diminished. Alterations in the nature of the purposes for which gas is used will also have their effect; and I leave out of consideration the result of fluctuation in cost of coals or residuals. If a large increase takes place in the day or summer consumption, the stationary customer can be served at a cheaper rate. So no one consumer can claim that he contributes an aliquot share to the balance available for profit, and is therefore entitled to pay no more or no less than the average price. The one-price system is simply a well-intentioned, but crude, attempt to secure justice for all. It is, however, not likely to approximate closer to that desirable, but unattainable, result than a well-arranged differential system based on the actual circumstances of the undertaking. And it is impossible to lay out a particular pattern, either on one price or on differential lines, that is applicable to any and every undertaking. Each must stand on its own bottom; and at the best, whatever the method of charging adopted, one can only proceed on broad general principles, dealing with the customers as including a few classes only, and not as individuals.

Some of the arguments adopted in the paper are simply those of the party who is out of the swim or on the wrong side of the hedge. This class of individual, like the poor, is always with us, and that without regard to the justice or otherwise of the system of charging. If we decide to serve all alike, or to suppose that we are doing so, by adopting one fixed price with no abatement or no discount, there is the injured individual who always pays down on the nail, while his neighbour takes three months' or six months' credit. The first has to pay a share of the cost of getting the money out of the second. Or another who, like the village blacksmith, is in evidence "week in week out from morn till night," and yet is thought of no more importance than the customer who is a sort of gas-consuming comet,

coming into touch with the rental-book for a few weeks only in midwinter, and out of sight on an eccentric orbit during the remainder of the year. There is also the large customer close to the works, who grumbles that he has to help pay for the mains and the leakage all over the district. The act of trying to meet one malcontent clears the way for another. If we introduce a scale of discounts according to quantity consumed—say, 5 per cent. for accounts of 100,000 cubic feet or over—we open the door for the unfortunate gentleman whose meter has "stopped short" at 99,000, and who does not forget to add many significant nods and shakes of the head in mentioning the fact, or the self-dubbed friend of the working man who wants to know why the luxurious mansion of the millionaire should be lighted at a cheaper rate than the cottage of the poor but respectable artisan. A discount of 2½ per cent. for cash in thirty days, brings with it the difficulty of dealing with the doubtful party who, having lost the prospect of the net, elects to take long credit for the gross, and is probably next heard of through the medium of a sheet of blue foolscap embellished with the royal coat of arms. Then there is the cheque for the net amount which reaches the office by post about the 20th of August (the last day for discounts being the 30th of July), and which the drawer wrote out and "intended" to leave at the office before going for his holiday, but left it in his pocket by mistake. If we make a deduction to users of stoves and engines, then the ground is cleared for the case of the gas-for-lighting customer, as so ably and forcibly put by Mr. Newbigging. Many who have adopted the differential price in the hope of "satisfying" their customers have been disappointed, and may have wished that they had kept to the old rule. The one price is certainly simpler and less troublesome than any system of discounts or abatements; but that does not touch upon the proposition laid down in the paper.

(To be continued.)

The Temperature of the Bunsen Flame has lately been measured by M. Beikenbusch, and found to be above 1820° C. According to the "American Electrician," M. Beikenbusch employed a thermo-couple; heating it by an electric current until it had the same temperature as that of the flame, so as to eliminate errors due to radiation and convection. The temperature of the thermo-couple for the same current was then measured in a vacuum.

Cement-Lined Water Mains.—During the American Civil War, when cast-iron pipe cost about $80 per ton, the use of this material for water-mains was almost out of the question in many communities; and this led to the introduction of cement-lined pipe, which was first brought prominently before the attention of water-works engineers by the late Phineas Ball, one of the best known of the early members of the American Society of Civil Engineers. One of the places to adopt it was New Bedford. In those days it was comparatively cheap; and it was believed that, with the probable decline in the price of cast iron, the interest saved by the use of the cement-lined pipe would be more than sufficient in twenty years to pay for replacing it with metal. Not only has this surmise proved true, but the old mains have been removed, and much larger pipe substituted than the original Commission would have felt warranted in adopting at a time when water-works were not regarded with favour by many New Bedford taxpayers. Of late years much of this pipe has been deteriorating rapidly; and the last main has now been taken up. The Superintendent of the Water Department (Mr. R. C. P. Coggeshall) and also the Water Board speak very highly of the wisdom of the Commission who introduced this kind of pipe.

Test of a Pumping-Engine.—The city of Pittsburg has put in a new Nordberg pumping-engine to supply water to the suburban districts; the water being drawn from filter-beds in the bottom of the river, through a 24-inch suction-pipe 600 feet long, and delivered through a 30-inch force-main 5200 feet long into a basin, from which it passes over a weir into the reservoir. The engine is of the quadruple-expansion direct-acting type, with a fly-wheel driven by connecting-rods from crossheads between the steam and water cylinders. There are four steam cylinders in two vertical tandem pairs, and two water cylinders. The steam cylinders are 19½, 29, 49½, and 57½ inches diameter; the double-acting plungers are 14¾ inches diameter, and the stroke is 42-inch. The engine was designed to deliver 6 million gallons per 24 hours against a pressure of 275 lbs. per square inch; the piston speed being 250 feet per minute, and the boiler pressure 200 lbs. Under the contract, it was guaranteed to have a duty of 110 million foot-pounds per million British thermal units, with a daily capacity of 6 million gallons; the duty and capacity being based on plunger displacement. Three series of tests were made. The general results of the duty test show the duty of the pump to be 162,948,824 foot-pounds per million British thermal units, which the steam that was supplied to the engine contained in excess of the feed-water returned to the boiler. The duty reckoned on the basis of 1000 lbs. of dry steam was 150,254,138 foot-pounds per 1000 lbs. of dry steam. The indicated horse power during the test was equal to 712; the dry steam per indicated horse power per hour was 12·263 lbs., the heat-units per indicated horse power per minute were 185·96. The capacity of the engine on the basis of plunger displacement was 6,225,052 gallons against a head of 602·7 feet.

TECHNICAL RECORD.

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Dublin.

Our report of the proceedings at this meeting (given last week, pp. 423-29) was complete except for the third paper—that by Mr. R. B. Anderson, Assoc.M.Inst.C.E.—which, in the author's absence, was read by the Hon. Secretary. It was as follows:—

IN FAVOUR OF DIFFERENTIAL PRICES FOR GAS.

I am induced to bring this subject before you, because I consider that, under certain circumstances, the system of having differential prices is attended with satisfactory results to both shareholders and consumers, and also because the case against the system was so forcibly expressed recently at the Gas Institute meeting by Mr. Thomas Newbigging, whose opinions many of us are perhaps too apt to adopt (without questioning their application), in consequence of the authority with which he is entitled to speak. In all cases, however, we should bring reason to bear upon the merits of our own particular circumstances.

In addressing my present audience, I am assuming that most of us are connected with towns in which the price of gas is necessarily high. Few of us have anything to do with gas under about 5s. per 1000 cubic feet; most of us know a good deal about prices running up to 6s. and 7s.; and a few of us, at the other end of the scale, have difficulty in making both ends meet with prices bordering on even 8s. Of 80 towns in Ireland of which I have statistics, I find: 61 charge 5s. and over; 40, 5s. 6d. and over; 31, 6s. and over; and 14, 7s. and over.

In his paper read to the Gas Institute, Mr. Newbigging dealt mainly with comparatively speaking low-priced gas. To-day I am referring chiefly to high-priced gas. It is to those having to charge the higher prices that the adoption of differential rates becomes of most advantage. As the ordinary price is less, the advisability of having differential rates becomes less, until you reach a price which admits of no abatement being made profitably.

In considering this question, managers generally associate it with extending the so-called "day consumption;" but I consider this, to a certain extent, a fallacy. If you could draw a line between consumption during hours of light draught and hours of heavy draught, as was for a time tried in Brussels, there would be some reason in it. But it is a mistake to call engine and cooking gas "day consumption"—used while mains and holders would otherwise be idle. During mid-winter, lighting, engines, fires, and cookers are in full swing together during the working hours of darkness—necessitating larger mains and holders than would have sufficed if gas were supplied for lighting only. Of course, in so far as such gas is used during the hours of daylight, an advantage does accrue from it, on that account, by keeping make and issue more evenly balanced; but in computing its cost, we are not entitled to altogether ignore capital charges for mains and holders.

I prefer to associate the question with "additional consumption," as I consider that is how the difference chargeable comes in; and differential rates are profitable chiefly because they enable one to sell more gas which otherwise would not be sold at all.

Let us now consider the cost of gas. I do not intend to burden you with many figures, but to succinctly summarize them. I would ask you not to criticize the figures themselves, but merely my application of them. I have analyzed the cost of gas in a certain town so:—

Pro ratâ charges per 1000	15 pence
Reducible charges per 1000	26 ,,
Profit to pay capital	39 ,,
Selling price	80 pence = 6s. 8d.

In the "*pro ratâ*" charges per 1000, I include coal, less products, *plus* purifying material and bad debts, because, quite irrespective of the quantity of gas made, the value of these per 1000 remains nearly constant. In the reducible charges, I include everything else except profit, because as you increase the make, the cost per 1000 of rents, rates, taxes, repairs, salaries, &c., tends to diminish.

Now what is the cost of additional gas? The *pro ratâ* charges remain approximately as before—say 15 pence. The reducible charges can be cut down to 16 pence, the figure which prevails in works of magnitude. Profit can be cut down to 1s., as any additional capital embarked will more nearly approach the cost per 1000 at which large works can be erected. For purposes of argument, I put it at about 16s. per 1000, at 6 per cent. Thus you see this particular company can sell additional gas profitably at 3s. 7d. per 1000, while their ordinary rate is 6s. 8d.—a very large margin.

If full advantage of approximating light draught and heavy draught could be taken, there would be a still further saving on the charge for profit, and also in the reducible charges. During winter, I do not see a practical way of giving the consumers a share of this saving; but I shall show later how it can be done during the summer.

Much has been written on the unfairness of differential rates. But in business, abstract justice has to give way to expediency;

therefore we should not refuse benefits to the many because consequential hardships (generally more imaginary than real) result to the few. Where is there a business all the methods of which are above the reproach of being judged unfair?

No matter upon what lines you conduct your business, charges of unfairness can be sustained against you with considerable plausibility by those inclined to do so. We have recently had an excellent lesson in this in the contradictory arguments advanced against the Southern Railway Amalgamation. Truly it is, that one man's meat is another man's poison. Self-preservation leads to self-interest; and until the millennium I fear it will not pay for gas companies only to be altruistic in their dealings.

I was much impressed by an article, on the basis of railway charges, which appeared in a recent volume of the "Economic Journal." Railways charge the rate which the traffic will bear. We can deal on similar lines. Gas for lighting will bear a certain price against all competitors; but gas for heating engines and cookers has to face quite a different competition, and will not bear nearly so high a rate. Provided you put all your consumers on the same footing, I do not see that any one should have much real cause to complain. Gas companies charging differential rates are not the only traders to whom awkward question can be addressed. Is it fair that paterfamilias and the lonely widow, who use vastly different quantities, should pay the same water-rate because they live in similar houses? Is it fair that a railway should carry folk casually going for pleasure at a cheaper rate than their constant passengers travelling for toil? Is it fair to your old consumers who have made your business for you that when you reduce the price you should allow their competitors to come on as new consumers at a price less than you for years have been charging your old friends? I have had consumers seriously argue that they as old consumers are entitled to some advantage over new ones. Such questions can be multiplied *ad lib.*; but they only tend to show the impossibility of offering terms hat will be considered fair by every party affected.

To those of you who may be contemplating a general reduction, I would suggest the following for your consideration: On your books you no doubt have many consumers who find it worth their while to burn gas at the present price, who would not be tempted to burn more by any reduction in price. If you reduce the price, you simply make these consumers a present, and look to recoup what you give to them from new consumers and old ones who increase their account. Now, by differential rates, you do not make the consumers who respond to your overtures by consuming more freely recompense you for the loss on those who do not; but all the benefit of the reduction goes to those who increase their turn-over with you.

General reductions are, of necessity, small; and those of you selling gas at 6s. or over will find it a long time before you can bring down the price to one low enough to tempt consumers to use engines, cookers, &c. But if you make a large reduction for these purposes, you can get them on at once and run no risk of loss of rental. I am no believer in trifling differences of 2½ and 5 per cent. I do not think there are many of you who could not afford to sell additional gas at 3s. 4d.; and I should say do so—no matter how much higher your other price may be. At one town we are charging two prices—6s. 8d. and 3s. 4d.

Some of you may be afraid to show such differences. At first you may be inundated with complaints that, if you can sell at 3s. 4d., you ought not to charge 6s. 8d., but you can answer them with reason on your side. In one town some years ago we were selling at 6s. and 3s. 4d.; and a campaign was started against our iniquities in the local twopenny paper, which fortunately had a very sensible and fair-minded Editor. I entered the lists, drew the fight from gas to papers, and showed that although it was necessary to charge 2d. for the local paper to make it pay, yet how profitable it would be if the Editor could get some of his subscribers to take a second copy at 1d.—the extra cost to him being merely paper, ink, and a little time. All present reporters, typesetters, &c., would suffice. He had sometimes been twitted for charging 2d. for his little paper—no larger than a Dublin halfpenny evening paper. I fought his case and our own at the same time, to our mutual satisfaction and the confusion of our enemies.

The usual method of differentiation is to charge one price for lighting gas and a lower price for gas used for other purposes; separate meters being fixed to register the two consumptions. To this there are several objections: 1st. An additional meter has to be installed and kept in order, read, booked, and accounted. 2nd. Separate fittings have to be run through the house. 3rd. Lights are sometimes connected on to the wrong system of fittings—accidentally or otherwise. 4th. Fraudulent consumers, by means of a rubber tube, can easily connect the two systems of piping. 5th. In many cases the cost of an extra meter, piping, &c., more than counterbalances the difference in price of gas; and in others the nuisance of running a pipe through a house with the concomitant taking up of carpets, &c., prevents the introduction of a fire, &c., which might have been installed if it could have been connected on to the nearest pipe of adequate size.

My first experience with differential rates was on this separate-meter system; and its defects quickly came home to me. In conversation with friends working on the same lines, I found it was not at all an uncommon practice for them to get over the difficulty of the extra piping and meter by assuming that, in certain cases, when a consumer put up a stove, all the increase in his account was attributable to the stove, and agreeing with the consumer to pay accordingly. It at once struck me that here was a way out of all my difficulties. It did not matter how a man burnt his gas so long as he burnt more; and accordingly we introduced what (for the sake of an explanatory name) I will call the "Cheap Additional Gas Scheme." We claim no novelty for this method; in fact after we had been using it for some years, we found it had been tried and abandoned by a gas company near London some years before we restarted it.

I will now describe how we introduced this system. In past records we had at hand the material for tabulating every existing consumer's account, and for estimating normal consumption for new consumers. Accordingly we tabulated a consumption for each consumer, and sent him a circular—see Form A—having an appropriate example suited to each individual worked out on it. The form of account adopted for working the system is shown in Form B.

[FORM A.]

_____ 189____

To Mr. _____

With a view to inducing you to burn gas for other purposes than lighting, it has been decided to charge you at the reduced rate of _____ per 1000 cubic feet for all the gas you use in excess of the quantities tabulated below, which have been estimated as average normal consumptions for lighting the premises you occupy.

Period ended _____ _____ 000 cubic feet.
" " _____ _____ 000 "
" " _____ _____ 000 "
" " _____ _____ 000 "
" " _____ _____ 000 "

For example: Suppose your consumption for the current period be _____ 000 cubic feet, then your account would be:—

_____ 000 c. ft. at . . . . . £ : :
_____ 000 c. ft. additional at . . . . £ : :
£ : :
As against _____ 000 c. ft. at. . . £ : :

[FORM B.]

Gas-Works, _____ 189____

Mr. _____

Present index of meter.			
Index of meter at commencement of period .			
To gas consumed during period ended on above date	00 cubic feet at 6/8 net .	£	
Tabulated consumption . .	00 do. do. at 6/8 net .	£	
Additional consumption . .	00 do. do. at 4/2 net .	£	
Meter-rent for same period		£	
Amount due		£	

Of late years it has, with reason, been proposed to make a charge for "readiness to supply;" but so far as I am aware no gas company has ventured to do so. But what we are doing is indirectly very much of this nature. We charge for the first few thousands higher than we do for the remainder; having, so to speak, recouped ourselves for our readiness to supply. Also the system is somewhat akin to what is known as the Brighton system of charging for electricity, under which the first few hours of consumption are charged at a higher rate than subsequent hours.

You will see that this system renders separate meters and meter-rents unnecessary—no second set of pipes need be run through the house. A geyser in the bath-room, a shaving-water heater in the bedroom, a boiling burner in the nursery, a cooker in the kitchen, a fire in the drawing-room—each or all can be connected to the nearest pipe of adequate size; or, if the existing pipes be too small, larger ones can often be run up in place of them with much less trouble than putting in separate ones would entail.

If consumers like to put up extra lights we do not mind, and the consumer has no temptation to defraud by using a rubber tube connection among his fittings.

The introduction of this scheme has entirely taken the wind out of the sails of that class of consumer which was so fond of telling us that if we would make a small reduction a lot more gas would be burnt. Now we merely say to them burn more, and the reduction comes to them automatically.

We draw no distinction between our consumers—the smallest and largest have some of their gas at the ordinary rate; and it is entirely in their own hands whether they have any at the low rate or not.

I may say that we find some consumers slow to appreciate the system, and grumble at us still. But the following will show how foundationless their complaints are, and how carelessly made. We have had several cases where consumers have wound up their complaint by saying: "Why do you not simply have one reasonable price." We have asked them to name what they consider a fair price, and they have named prices which worked out at more than they were actually paying. Only the other day one said he would prefer we charged him 5s. 6d., rather than charge our differential rates of 6s. 8d. and 4s. 2d. On it being shown to him that his account averaged out at 4s. 10d., he retired with a very satisfied "Humph, I had not troubled to calculate that myself."

Having a large consumption at low rate will eventually react upon the ordinary rate, and enable it to be lowered; but I must confess that my sympathies are chiefly with the users of the cheap gas, and I would prefer to reduce the additional gas price to nearly the minimum profitable rate before touching the ordinary price.

In 1893 a company near London, on our recommendation, adopted the system; and Mr. Livesey denounced it very emphatically in a paper he read before the Institution of Gas Engineers—prophesying that it would raise an angry feeling among the consumers. This, so far as I know, has not been the case. We find with our own consumers, it has rather tended to pacify them; and I instance the following in support of what I say: We introduced the system in one town some six or seven years ago, and last year got a new Act of Parliament without opposition—proving that our relations with our consumers are by no means bad; and, as far as I am aware, not a single individual took advantage of the opportunity to write or speak against the system either in the Press or at the Council meetings.

So far I have not suggested selling any gas at anything less than a directly profitable price. There are exceptional cases though when selling directly at a loss might be justified from expediency, in consequence of the benefits indirectly accruing. Cheap motive power may be the means of starting industries in a town. Gas companies cannot assist new industries by subscribing for shares or lending money, &c. A grocer in a town may wittingly sacrifice a few hundred pounds to get a mill or a factory started, knowing that a factory means wages being spent in his shop. Gas companies cannot take shares to help on such a company; but they can nevertheless assist by supplying at a direct loss—or even free, if they feel the loss will indirectly be made good to them.

If you lower the ordinary price by a small reduction, it takes a long time to rehabilitate your profit and loss account. A small reduction may induce a few new consumers, and some extra consumption by existing ones; but it does not offer a great inducement to a man to change his habits. If you make a large reduction though, it makes him consider the introduction of engines, cookers, advertising devices, &c. His feeling is: "The extra cost is not much—I will have it."

In one town charging 6s. 8d. we were undecided whether to reduce the price or introduce a differential rate. We made a special scrutiny of the town, and came to the conclusion that we had on our books nearly every good shop in the place excepting a few who burnt oil because they dealt in it. We inquired closely as to any others who did not burn gas, and found they fell into three classes—some who objected to gas at any price; others who would not pay deposits, and could not safely be given credit; and others whose accounts would hardly be worth having. We came across hardly any who would have been tempted to come on as consumers at even a 5s. price. In this town a few years before a reduction to 6s. 3d. had been made temporarily, with results not altogether satisfactory to the exchequer. In consequence of a rise in the price of coal, the price was put back to 6s. 8d.; and when coal fell again a 5s. rate was introduced for additional gas with such satisfactory results that a further reduction to 4s. 2d. was made three years later. The result has been that the private consumption, which was not increasing at 6s. 8d., and was hardly influenced by a reduction to 6s. 3d., has practically doubled itself in the last six years since the "Cheap Additional Gas Scheme" was introduced. Up to 1886, this company had charged 7s., and the consumption actually decreased for two years after the price was reduced to 6s. 8d. and 6s. 3d. Thus the company had reason to pause ere they made another reduction in the ordinary price.

In another town gas was sold at 6s. 9d.; and the consumption was falling. The price was reduced to 5s. 10d., which was rather an heroic step to take. The consumption continued to fall for another year; but it then slowly increased for four years, though still under what it was when 6s. 9d. was charged. We then, in 1892, introduced a 4s. 7d. rate for additional gas—further reduced to 4s. 2d. in 1896; and the result has been that the private consumption has increased by more than 53 per cent. in the past six years.

I have referred to the advantage of balancing the light and heavy draughts by augmenting the consumption during hours of daylight by getting the benefit of using our plant more fully up to its capacity for a longer time. In one town we are experimenting in this direction. Our prices are 6s. 8d. for ordinary gas, 5s. for additional gas during winter, and 3s. 4d. for additional gas during summer. I never anticipate that the hourly summer draught will exceed what our mains (designed for heaviest winter consumption) are adequate for, or that we shall ever feel during the summer that our holders are too small. We must have holders and mains to supply our winter work, a large proportion of the capacity of which is useless during the summer. The whole capital charge need not be debited against gas which will merely harmlessly flow through them. Hence a reduced charge in summer time is, I consider, justifiable. In this small town we have in consequence just hired out a couple of dozen cookers. We started the experiment in 1898, and had practically no complaints when the price was raised again after the summer, which was rather a surprise to us.

No one wishes more than I do to sell cheap gas; and it is because of this desire that I am so ardently in favour of differential prices.

Discussion.

Mr. C. B. TULLY (Sligo) said he must endorse all that Mr. Anderson had said in his paper. Some years ago, he adopted differential rates, somewhat on the same lines. He gave a reduction of 33⅓ per cent., making their prices 4s. 2d. and 2s. 9d. per 1000 cubic feet. They had started cooking-stoves, but had found that their consumers would not take them in when the price of gas was 5s. He saw that it was useless to go on; and so they reduced the price and their capital charges from £1 0s. 6d. to 12s. 6d. per 1000 cubic feet. Altogether it had been a great success. He thought that Mr. Newbigging in his paper referred mostly to large undertakings, in which they had not the same necessity for reducing the price of the gas.

Mr. JOHN LYNE (Wexford) said he heard Mr. Newbigging's paper read at the Gas Institute; and he thought that he made out a very good case. In his opinion, Mr. Anderson had failed completely to prove what he had been trying to advance. Mr. Anderson certainly had been speaking of good fat prices all round—6s., 7s., and 8s. per 1000 cubic feet. It seemed to him that the difference between 6s. 8d. and 3s. 4d. to gas consumers in the same town was monstrous. He took it that there was a profit at 3s. 4d.; and if there were, what profit must there be at 6s. or 6s. 8d.? His opinion was that there was a mean between what Mr. Newbigging had been contending for and what Mr. Anderson was trying to advance. He thought it would be a gross injustice to consumers who used gas for lighting—who were really the best customers—to make such a large difference in price between the charges for cooking and for lighting purposes. In his own case, he had a differential rate; but he drew the line at a minimum consumption of 50,000 cubic feet per quarter for gas-engines and for bakers' plates. The prices in Wexford were 3s. per 1000 cubic feet for lighting, and 2s. 8d. for the other purposes, both prices free of meter-rent. He made no reduction for cooking. He would like to know if Mr. Tully had a profit in selling gas at 2s. 9d. per 1000 cubic feet.

Mr. TULLY explained that the cost was the same, and that by improving their settings they were able to carbonize more coal. They certainly had a profit at 2s. 9d.

Mr. LYNE said, that being so, Mr. Tully, like Mr. Anderson, though in a lesser degree, made an enormous profit on the consumer who used gas for lighting only.

Mr. S. B. LANGLANDS (Coleraine) said he was an advocate, so far as he could go, of giving the lighting consumers any benefit there might be. If Mr. Tully reduced his price to 3s. 6d. all round, he thought it would be fairer to the consumers. He did not believe in catering for people who were not their backbone. He could not say that Mr. Anderson had made out a plausible case at all.

The HON. SECRETARY said it seemed to him that the paper was a piece of special pleading—that Mr. Anderson's method was simply expediency, and that it was not a question of what was just and right. It was getting more gas to sell, and the men working for nothing. It seemed to him to be silly to do so. He gave the Town Commissioners gas at a cheaper rate; but this was a method of paying for wayleave.

Mr. J. G. TOOMS (Carrick-on-Suir) said that, seeing he was employed in one of Mr. Anderson's works, he was sorry that Mr. Anderson was not present to reply to the discussion. He was not answering the discussion; but he might say that he was managing one of the works where differential rates were charged. Selling gas at 6s. 8d., they were only just able to pay their way. The consumption was going back; there was no industry; and nothing was thriving in the town. What could they do to keep the gas-works from going bankrupt, as small works were doing all over Ireland? If they reduced the price from 6s. 8d. to 5s. 6d., with the same consumption there would be a loss; but if they brought it down to 3s. 4d., there would be an increased consumption. If, however, they supplied the whole at 3s. 4d., there would not be an increase of revenue. A year ago they had four cookers in the town; there were now over forty at work, with the result that their consumption was about 150 per cent. larger than it was even a year ago. He could not say that there were any extra expenses at all, as regarded gas-making, because his was a small works, and he had to keep practically the same staff on in summer as in winter; and it was as easy for a stoker to make 4000 or 5000 cubic feet as to make 1000 cubic feet. By giving a differential rate, he was positive they had put gas into houses where they would otherwise never have taken it in at all. One consumer who formerly only used about 2000 cubic feet was now burning about 30,000 cubic feet a year, simply because he had introduced gas for heating, cooking, washing bottles, and the like.

Mr. LYNE remarked that Mr. Tooms had contradicted himself, as he distinctly stated, in answer to a question from him (Mr. Lyne) that there was a profit at 3s. 4d.; whereas now he said they were barely able to live by selling at 6s. 8d.

Mr. J. RICHMOND (Kilkenny) pointed out that in places where gas was dear, coal was also dear, and consumers had the same advantage in the use of gas as in the use of coal. He was of opinion that the granting of differential rates for gas was very largely a matter of taking it out of one pocket and putting it into another.

Mr. T. J. COTTON (Dublin) said he had listened attentively to the discussion. He had had experience of both systems of charging for gas; and he found that the new system of giving very large discounts, and having differential prices, was one

which created a large amount of distrust and suspicion among consumers. He would rather see an endeavour made to sell gas at as low a price as possible, compatible with a fair return.

The PRESIDENT thought thanks were due to Mr. Anderson for bringing the subject forward. As he said in his presidential address, he approved of differential rates as a means to an end. There was no use in their trying to introduce gas for cooking purposes at 5s. 10d., or, in fact, at any price above (say) 4s. per 1000 cubic feet. How were they to get the price down? He thought the best way was to make a slight difference. There were a great many charges—rents and taxes, for example—which might all be safely deducted; and they might still have a small profit, and be able to reduce their lighting charges too. He did not uphold the system as a matter of principle. As to local authorities, he thought they should pay for the gas they consumed; and if gas undertakings had to pay for wayleave, the amounts should go through the books of both parties in the regular manner.

As already intimated, Mr. ANDERSON was not present at the meeting to read his paper, and reply to the discussion upon it. He has, however, since sent the following notes on the various speakers' remarks: With gas at the low rate at which Mr. Lyne is able to sell at Wexford, there is little (if any) reason to resort to differential rates to increase consumption. If Mr. Langlands could be sure of having the same quantity of gas sold, and money earned, by a uniform price of 3s. 6d. as Mr. Tully earns with his prices of 4s. 2d. and 2s. 9d., of course, there would be no advantage in Mr. Tully's prices; but my opinion is that, if Mr. Tully had reduced to 3s. 6d., his present consumption and rental would not have been reached. Mr. Whimster does not follow me when he says we sell more gas at no profit. All the extra gas sold does yield a profit sufficient to remunerate the extra capital rendered necessary, and to leave some surplus over to pay something more to the manager and his men. I quite agree with the President that it is almost hopeless to do much with cookers with gas at a price over 4s.; and if gas companies now charging 5s. and 6s. adhere to uniform prices, I fear it will be a very long time ere the consumers in their towns can avail themselves of the advantages of gas cooking. On the other hand, by adopting differential prices I feel they can immediately and profitably place these advantages in the hands of their consumers, and rapidly bring down the average price at which they sell gas below that to which they could profitably reduce a uniform price. I may add that, once we fix a tabulated consumption, it stands for all futurity, unless we have reason to consider it to have been badly estimated. We have reduced several individual cases, where consumers satisfied us their tables were abnormal.

Corrosion of Metals by Sea Water.—In a recent number of "Engineering," an account was given of some interesting experiments on the corrosion of metals by sea water, which have been carried out at Kiel during the past two years. The plan followed was to cut off twelve specimens of the metal to be tested, of which three were kept as "witnesses," while the other nine were placed in salt water. At the end of eight months, three of the latter were withdrawn and compared with the "witnesses." Eight months later a second set were withdrawn and a fresh comparison made; those then left being taken out after the lapse of a third period of eight months. The metals tested included alloys of copper rich in zinc, bronzes containing little zinc, bronzes containing no zinc, pure aluminium bronzes, and finally bronzes containing aluminium and zinc or zinc and iron. The bronzes containing iron, when placed in contact with those of tin, showed a loss by corrosion. It is thus important, if corrosion is to be prevented, to avoid placing these alloys in contact with metals electro-positive to them.

The Autumn Meeting of the Institution of Gas Engineers.—The official programme has now been issued for the visit of the members of the Institution to Berlin and Copenhagen next month. The party will leave London on Friday evening, the 8th prox., and travel *viâ* Flushing direct to Berlin, where, on their arrival on Saturday evening, there will be a reception at the station by the Committee of the Association of German Gas and Water Engineers. The following day will be occupied in driving through the city and an afternoon trip by steamer to Potsdam; in the evening the members being entertained at dinner by the German Association. On Monday, a visit will be paid to the Gitschiner Strasse station of the Imperial Continental Gas Association, and (after lunch) to the Municipal Works of Charlottenburg. On Tuesday morning the party will journey to Copenhagen; and next day an inspection will be made of the coal-hoisting machinery of the Danish Coal Company, the free harbour and quays, and the Temporley coal conveyor. The afternoon of this day is to be occupied with a visit to the Eastern Works of the Copenhagen Municipality. The members will afterwards drive to Skodsborg, and dine with the Copenhagen Municipal Lighting Committee. On Thursday the Frederiksberg Works of the Danish Gas Company will be visited; and after luncheon at the works, there will be a drive round the city, ending up with a reception and dinner at the Tivoli—the members being the guests of the Directors of the Danish Gas Company. Friday will be occupied with non-official visits to objects of interest in Copenhagen; and it is arranged for the return journey to be commenced about mid-day Saturday, so as to permit of the party being back in London the following (Sunday) evening.

REGISTER OF PATENTS.

Automatically Supplying Gas to Jets and Lighting and Extinguishing Same.—Boult, A. J.; a communication from the Automatic Gas Lighting and Extinguishing Company, Limited (Hoare and Kennedy's Patent), of Perth, Western Australia. No. 17,250; Aug. 10, 1898.

This invention relates to supplying gas to, and lighting and extinguishing, gas-lights from a distance by utilizing the increase or decrease of pressure of the gas in the mains. A bye-pass flame is here required during such time as the main flame is extinguished—when the latter is alight, the bye-pass flame is extinguished.

The arrangement essentially consists of a bifurcated or Y-shaped pipe, with a trunk of such a length as to project downwards sufficiently far into a body of liquid as to ensure its lower end being sealed by the liquid (which latter is contained in a chamber preferably of circular form). The liquid may be water, oil, or glycerine—a liquid of a non-evaporative nature being used by preference. One branch of the bifurcated shaped pipe is connected to the gas-supply main, while the other is in connection with the burner. For the bye-pass flame a secondary and similarly constructed bifurcated pipe is used, connected to its own burner and to the gas supply in similar manner as that of the main burner apparatus. The vessel for containing the sealing liquid is divided into two compartments—one hermetically sealed from the outer air, except as mentioned later on (and this one contains the bye-pass flame apparatus); while the compartment which contains the main burner apparatus is open to the air.

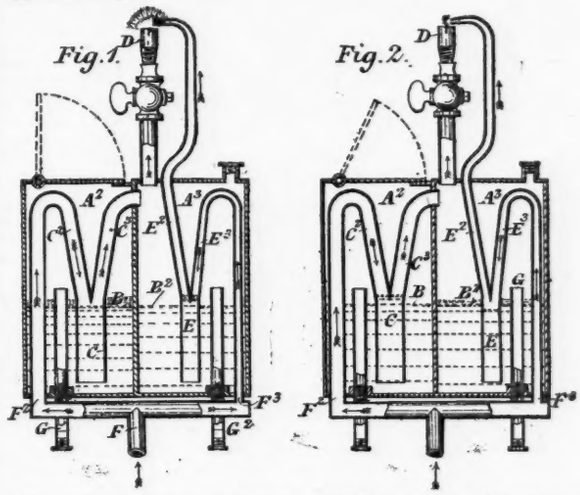


Fig. 1 shows the gas passage for the main burner open and the burner alight; and conversely the gas passage for the bye-pass is closed and the flame extinguished. The sealing liquids are at the levels necessary to obtain this result. Fig. 2 is a similar view, except that the main burner is extinguished and the bye-pass flame alight; the sealing liquids being at the altered levels necessary to obtain this result.

An ordinary cylindrical vessel is here shown, divided by a partition into chambers A^2 A^3, in which are contained the sealing liquids B, B^2. The former compartment is open to the air, and is provided with a hinged door; while the latter is hermetically sealed from the outer air, except by way of the main burner, and is provided with a filler having a screwed cap. In the left-hand chamber is placed a Y-shaped pipe, whose lower end C depends into the sealing liquid B. The branch C^2 is connected to the main gas-supply pipe, and C^3 is its fellow branch for supplying the main burner D. In the sealed chamber A^3 is placed a bifurcated pipe for the bye-pass flame, constructed in similar manner to that for the main burner, and having the trunk E which projects into its own sealing agent, and also made with the branches E^2, E^3. The bye-pass flame or pilot burner is connected to the former branch as shown. F is the pipe leading from the gas-supply main, and having two vertical extensions F^2, F^3. G and G^2 are pipes to regulate the predetermined levels of the sealing liquids in their respective chambers; being screwed so as to be vertically adjustable.

When working, immediately upon the increased or "night pressure" being turned on in the mains, the gas passes through supply-pipes F and F^2, and so into the branch C^2 of the Y-shaped pipe; and its pressure is concurrently exerted on the face of that portion of the sealing liquid B, which is contained within the trunk junction piece C. The gas thus displaces the fluid to the necessary extent (as shown in Fig. 1) to create a passage for the gas, which now proceeds in its travel through the fellow branch C^3, and is delivered into the sealed chamber A^3. From this chamber, the main burner D is fed by its pipe connection D^2. (The burner D, in the first instance, is lighted by hand.) The gas is delivered from the branch C^3 into the sealed chamber A^3; and the gas being at the "night" pressure, exerts pressure on the face of the sealing liquid in the chamber, with the result that the liquid is forced up the trunk E, and closes the bye-pass flame passage. It is further evident that, upon the turning on of the "night" pressure, pressure is also concurrently exerted, through the pipe E^3, on the face of the portion of the fluid contained within the trunk junction E of the apparatus for supplying the bye-pass flame; but the area of such lesser portion in E being small in proportion to the face area of the liquid in the sealed chamber A^3, the bye-pass flame passage remains closed. When it is desired to extinguish the main burner D, the pressure is reduced to such a degree as to allow an opposite action to take place, when the liquid B is found to rise in the trunk C and close the main burner passage, and the liquid B^2 to concurrently fall in the trunk E and open the passage which supplies the bye-pass, which is ignited by the expiring flame of the main burner.

Gas Washer and Scrubber.—Yeadon, A. W. N. & S. N., of Leeds. No. 17,838; Aug. 19, 1898.

This invention consists in the use of a horizontal cylinder (revolving on outside bearing rollers, and fitted with a stationary mouthpiece at each end), with an internal central tube and a continuous gas-tight spiral screw, with perforated division-plates fixed in it. The space in the divisions is filled with wood balls, grids, or other appliances "for finely dividing the water, and thus securing, by means of the adoption of the spiral form, a largely increased cubic area for containing the balls or grids and free passage of the gas, and consequently securing that a larger proportionate quantity of gas can be passed through the increased area of washing surface, and become freed from the ammonia and other gaseous impurities."

Fig. 1 shows a longitudinal section of the washer; fig. 2 a plan; fig. 3

Fig. 3.

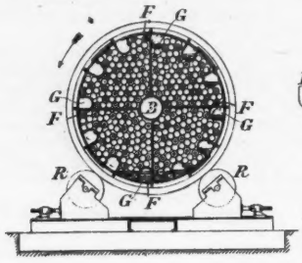


Fig. 1.

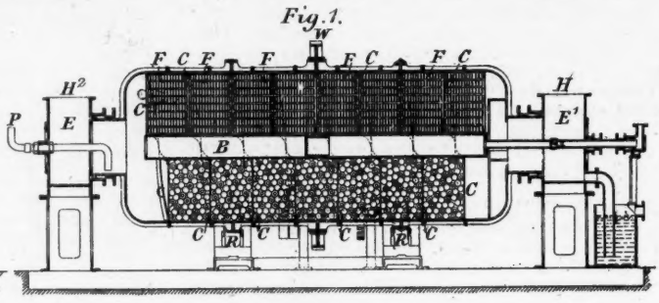


Fig. 2.

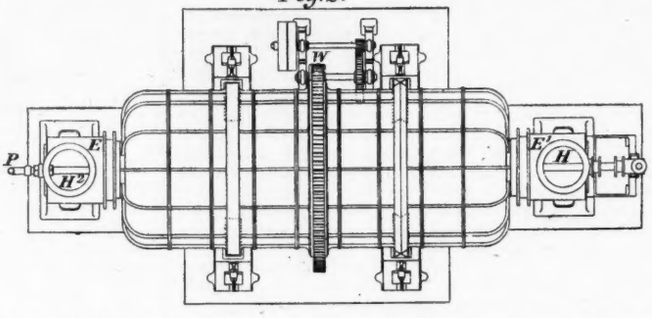


Fig. 4.

a transverse section of the division-plates, wood balls, and buckets; and fig. 4 a section of the discharging vanes for the ammoniacal liquor.

Inside the revolving cylinder, and running nearly its entire length, is a central tube B, closed at one or both ends. Between the outside circumference of the tube and the internal surface of the cylinder, is a continuous spiral screw C, which also runs nearly the whole length of the cylinder. The ends of the cylinder are of a smaller diameter, and revolve in stationary mouthpieces E E^1, at each end, fitted with adjustable glands to keep the cylinder ends gas-tight. In different parts of the spiral screw, and at suitable distances apart, are fixed any number of perforated division-plates F, through which the gas has to pass. The plates divide the cubic area contained in the spiral screw into a series of chambers, each filled in with wood balls; the dividing-plates preventing the balls working through the cylinder as it revolves.

In any part of the mouthpiece E is inserted a pipe P for the inlet of water; and at the bottom of the inlet mouthpiece E^1, is fixed a sealed outlet-pipe (ending in a cistern) for the escape of the ammoniacal liquor after it has passed through the cylinder. The other end is fitted with spiral or coil pipes, by means of which, as the cylinder revolves, the ammoniacal liquor is raised from the bottom of the cylinder, and delivered automatically through the small end and the sealed pipe.

At the back of each of the perforated division-plates, and close to the internal surface of the cylinder, is fixed a bucket G for raising the water lying at the bottom of the cylinder, and pouring it over the wood balls so as to keep their surfaces constantly wet and dripping—carrying the water forward with the next division of the screw. Other auxiliary buckets, perforated or solid, can be fixed to the internal surface of the cylinder between the division-plates, to pour the water on the balls—the number, size, shape, and perforation of the buckets being adjusted to keep the balls constantly wet, and to carry the water continuously forward through the spiral screw. On the outside of the cylinder there are bearing rings, turned so as to revolve truly on the bearing rollers R underneath. One of the rings is made of Λ shape, with the bearing rollers made so as to prevent the cylinder working endwise. On the circumference of the cylinder is a toothed wheel W, driven by suitable gearing, for communicating the revolving motion.

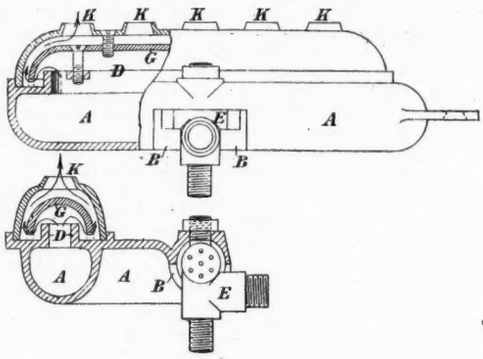
The pure water is admitted to the cylinder through the pipe P; and after going through the cylinder, it escapes by the sealed outlet-pipe at the other end. The gas entering at H meets the water; and after passing through the cylinder, escapes at the outlet-pipe H^2.

Clockwork Mechanism for Fluid-Meters.—Brewin, J., and Rodgerson, J., of Liverpool. No. 19,130; Sept. 8, 1898.

This invention relates to the clockwork mechanism of fluid-meters wherein a marking device, operated by, and sensitive to, fluctuations in the volume of water passing through the meter, draws a diagram upon a moving chart, so as to afford a record of the different volumes of water passing at stated times. The invention mainly relates to the means by which the chart is caused to revolve at different speeds by one and the same clock. That is to say, the chart may be caused to make one complete revolution in six hours, twenty-four hours, six days, seven days, or other period, by the same clock, and with the same cylinder or diagram carrier. This result is attained by making use of two or more spindles or shafts having a common axis and revolving at different speeds. The shafts carry discs in which a gap or aperture is made; and into these gaps a sliding pawl or stop is adapted to enter, and is carried by the diagram carrier in such a way that, by moving the pawl, the carrier is engaged with one or other of the discs, whereby the diagram will revolve at different speeds according to the disc with which it is engaged.

Atmospheric Burners for Gas-Stoves.—Wright, J. W. B., and Darwin, H., of Birmingham. No. 18,411; Aug. 27, 1898.

The object of this invention is to prevent the firing-back of the flame—"a fruitful cause of annoyance and injury." Numerous efforts have, of course, been made to attain this end; being mainly directed to the part of the burner at which the gas is admitted. In the present invention, on the contrary, the patentees have directed their efforts to the part of the burner from which the gas mixture is emitted; the result being the form shown in the engraving.



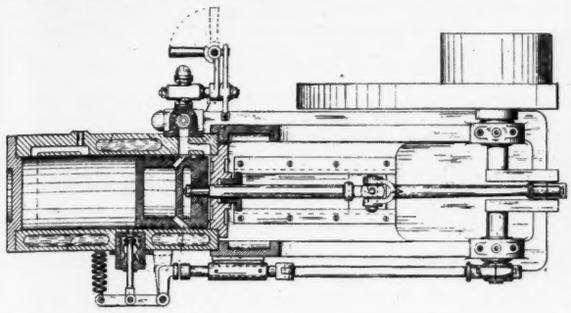
A is the mixing-chamber of the burner, formed with an air-inlet B and a plate with a raised lip D above the mixing-chamber. E is a double-ended gas-inlet, fitted with perforated nozzles. G is a cone supported above the mixing-chamber, and leaving a space for the passage of the gas and air as indicated by the arrows. The outer cone is cemented to the lower portion of the burner; and thus the mixed gas and air become "concentrated and conducted" to the points of ignition K. The result of using the two cones is that no blast of air beating down upon the flame, or any alteration in the force of gas or currents of air passing into the burner, has any effect upon the flame, in forcing it back to the gas-inlet.

Gas-Engines.—Hirt, G., and Horn, G., of Nuremberg, Germany. No. 22,143; Oct. 21, 1898.

This invention has for its object to construct a gas-engine which will receive an impulse every revolution—every forward stroke of the piston being effective. By this means, it is claimed that the disadvantages of the four-cycle stroke system are obviated, and the size of the engine is reduced.

As shown, in the cylinder is a piston connected to the crank-shaft of the engine in the ordinary manner; while the cylinder is closed at each end by covers, and is provided with the usual water-jacket. The piston is made with a hollow chamber, and has two channels, one of which communicates with the admission and firing chambers, and the other with the exhaust port. In connection with the admission-chamber is the inlet-valve, for admitting the mixture of gas and air to the cylinder. The inlet-valve is controlled by the governor when the engine is running, or it can be thrown out of gear with the governor and the valve operated by hand for the purpose of starting or stopping the engine. The exhaust

valve is opened by an eccentric and sliding rod on the crank-shaft; the end of the sliding rod bearing against one arm of a bell-crank lever, while the other arm of the lever is connected to the valve spindle, and has a spring attached to it for closing the valve as the eccentric pulls the sliding rod away from the bell-crank lever.



The action of the engine is as follows: As the piston travels from right to left, a charge of gas and air is admitted through the inlet-valve into the cylinder in front of the piston; and on the return or forward stroke, when the piston nears the end of its stroke, the charge of gas and air is forced into the admission-chamber and compressed there until the piston reaches the end of its stroke. Then one of the channels in the piston comes into communication with the admission-chamber; and the compressed charge of gas and air passes through the channel into the hollow body of the piston, and is conveyed to the other end of the cylinder, where the charge escapes through the channel into the firing-chamber. It is here fired, and the products of combustion pass along the firing-chamber to the back of the piston, and give it the impulse for the second forward stroke—at the same time compressing the next charge in front of the piston.

The exhaust valve is opened at about half way in the forward stroke, and remains open till the end of the stroke; and any of the charge left in the body of the piston escapes through the channel in it during its passage over the exhaust port. The products of combustion also escape from the cylinder; the remaining gas at atmospheric pressure (compressed at the back-stroke of the piston) being again utilized by being mixed with the fresh charge and fired, and so compensating for any loss from leakage in the charge brought down in the body of the piston.

The cycle of events is as follows: In the forward stroke, the charge is fired, and the exhaust is opened; also the fresh charge is compressed in front of the piston. In the back stroke, the charge is conveyed in the body of the piston to the firing-chamber, and a fresh charge is drawn into the cylinder ready for compression on the forward stroke. The piston, therefore, receives an impulse every forward stroke.

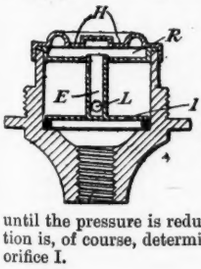
Bunsen Burners.—Imray, O.; a communication from J. Moeller, of Palmer Street, Westminster. No. 19,778; Sept. 17, 1898.

The patentee points out that in bunsen burners the gas usually issues by a small circular jet, or a number of still smaller circular jets, into the tube where it mingles with air drawn in by lateral orifices; and his invention relates to "simple means of more effectually mixing the gas with the air, so that the mixture undergoes more complete combustion."

For this purpose (as shown), the circular jet hole by which the gas issues is slightly notched at the top (by the blow of a chisel) so that the metal presents two slight depressions around the hole, the effect of which is that the gas—instead of issuing in a cylindrical column as indicated by the central dotted lines—is spread out laterally, as indicated by the outer dotted lines, so as to mingle with the air that ascends with it. Instead of only two notches, there might, of course, be any other even number produced by turning the chisel to various angles.

Gas-Burner Governors.—Goodson, J., of Maze Pond, S.E. No. 9504; May 5, 1899.

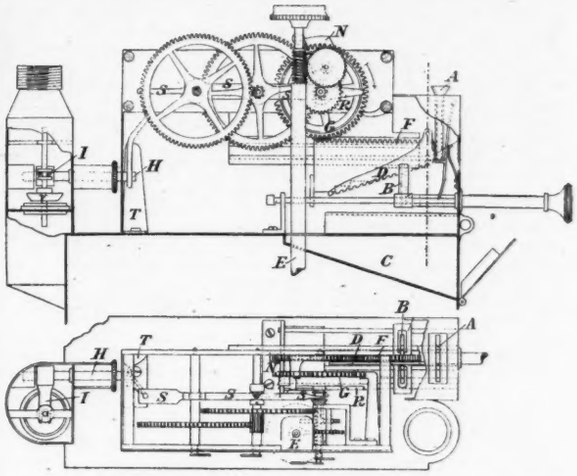
The construction of the governor is shown in the engraving. The gas supply passes through the inlet orifice I in central diaphragm into the chamber above, and thence through perforations L in the tube E, chamber R, and perforations H, to the burner. A gauze-wire diaphragm is stretched across the lower part of the central chamber. So long as the supply pressure remains normal, the float keeps in its lowermost position, admitting a full supply of gas to the burner; but should the pressure be increased, it acts on the underside of the float and raises it, thereby causing the upper orifice of the tube E to approach the recess in the cap of the chamber R, and throttle the supply until the pressure is reduced to the normal. The rate of gas consumption is, of course, determined by the diameter of the tube E or its inlet orifice I.



Prepayment Gas-Meters.—Hallengreen, H. A. J., of Stubbekoebing, Denmark. No. 9905; May 10, 1899.

In the engraving, this invention is shown applied to a wet gas-meter in which the price of the gas is calculated at 3 kroner (3s. 3d.) per 1000 cubic feet.

In the meter case is arranged a funnel-shaped shoot A, through which the coins are introduced. Below the shoot is a plate attached to a moveable arm actuated by a spring. A slide, carrying a shoot B adapted to be brought below the shoot A in such a manner that it forms a prolongation of it, can be pushed in and out by being slid upon rails, upon whose upper edges the coins on falling through will remain standing. The slide is provided with a rod (terminating in a knob) projecting through the front side of the case. In the middle of the shoot B is a slot into which a flat moveable plate projects, the lower edge of which is cut into steps having one side parallel with the upper edges of the rails, while the other side is at right angles to them. On one side of the plate is fixed a dove-tailed rail, capable of sliding in a corresponding groove in a plate fixed to the case of the meter; and at the end of the rails is an opening through which the coins fall down into a till C.



When the consumer has placed a coin in the shoot A, it remains standing upon the plate below it until the knob, and with it the shoot B, is pulled out. By this movement the coin will fall down into the second shoot, and remain standing upon the edges of the rails. When the knob is pushed in, the coin is carried along until its upper edge strikes against one of the offsets upon the stepped plate, and moves the latter along until the coin, when the shoot B reaches the end of the rails, slips out and drops down into the till. When the knob is again pulled out, a head upon a rod fixed upon the slide will strike against the plate, or against a lug thereon, and carry the plate back to the starting point.

In order to prevent the consumer using the same coin several times, by omitting to push the shoot B in far enough to cause the coin to slip over the edge of the rails, an arm, arranged to turn upon a pivot D, is placed alongside the stepped plate. The lower edge of the plate D is formed like a rack—the edges of the teeth turned away from the shoot being vertical. When at rest, the arm (on account of its weight) rests with a small projection against the shoot A, and protruding into the slot alongside the stepped plate.

If the consumer, after having put a coin into the shoot A and moved the shoot B a certain distance, should forget that a coin has already been placed in position, and therefore wish to pull the shoot back in order to place a coin therein (which would occasion a loss to the consumer, as the stepped plate will only be moved a distance corresponding to the value of the coin first placed in position), a small tooth upon one of the rails will prevent the plate from being released. The second coin cannot therefore fall down into the shoot B before the first one has been used for moving the plate.

E is the shaft upon the lower end of which is placed the drum which rotates whenever gas passes through the meter; and the rotation of this shaft is, by means of a worm and wheel, as well as by cog wheels, transmitted to the other parts of the registering mechanism. The apparatus works in the following manner: When a coin has been placed in the shoot B, the stepped plate is moved by pressing on the knob. The rack F will thereby turn the ratchet-wheel N through a distance corresponding to the value of the coin. The pawl will act upon the teeth of the wheel G, and move it along. As it turns round, the flange against which the cross-arm R is pressed by the spring T, acting through the lever S, will slide upon the arm R. As long as the lever maintains the position shown, the valve V will be kept open, and the gas will flow in the usual manner. Under the action of the shaft E the meter wheels will turn, and the cross-arm R will also turn. When it reaches the notch Q, it will (under the action of the spring T) be forced down into the notch. The lever S is thereby rocked, and with it the shaft H, whereby the arm I is lowered and the valve V is closed. The supply of gas is thus stopped, and will only start again when the stepped plate is once more pushed inward by means of a coin placed in the shoot B.

APPLICATIONS FOR LETTERS PATENT.

16,141.—Seymour, J., and Clark, W. J., "Gas-meters." Aug. 8.
16,147.—Schwander, F., "Production of gas." Aug. 8.
16,154.—Coppee, E. N., "Coke-ovens." Aug. 8.
16,166.—Boult, A. J., "Mantles for incandescent gas lighting." A communication from F. Isitt. Aug. 8.
16,177.—Atkinson, I., and Koerte, C., "Oil and gas engines." Aug. 9.
16,194.—Moses, M., "Acetylene gas-generator." Aug. 9.
16,212.—Burkert, H., "Incandescent gas-burners." Aug. 9.
16,218.—Marmonier, M. F., "Explosion motors." Aug. 9.
16,235.—Partl, L., "Acetylene gas-generator." Aug. 9.
16,238.—Erdmann, H., "Gas-burners." Aug. 9.
16,248.—Abel, C. D., "Gas-engines." A communication from The Gasmotoren Fabrik Deutz. Aug. 9.
16,249.—Küpper, F., and Vorreiter, A., "Speed governor for internal combustion motors." Aug. 9.
16,265.—Dargue, W. H., "Generation of acetylene gas." Aug. 10.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Hastings Carburation Process.

SIR,—In the correspondence which appeared in the "JOURNAL" during the latter part of 1898, and the beginning of the present year, I endeavoured to clear up the haziness which at that time seemed to exist in regard to the manner in which the above process prevented the deposition of naphthalene in the solid form. It was then demonstrated that Mr. Botley's theory, that an artificial vapour tension was created by the spraying of the oil into the gas, however fine might be the state of division, was erroneous, and that the sprayed oil had the very reverse effect, and acted as it does in kindred processes for the removal of hydrocarbon vapours from gases, and instead of creating or raising the vapour tension of the naphthalene, reduced the tension, and that the naphthalene was absorbed by the finely-divided oil spray. In short, it was shown that the process was an oil scrubbing process carried out in the mains and services, and that when the oil spray was in a sufficiently fine state of division, the dissolved naphthalene was carried forward and through the consumers' burner; but that, on the other hand, when the oil spray was in larger particles, the oil was precipitated, and flowed to the drip-well, from which it was pumped. It was further shown that the action of the process was, in many respects, analogous to the manner in which carburetted water gas acts in preventing trouble from the deposit of naphthalene in the solid form; that, owing to the way in which carburetted water gas is condensed, the sudden cooling caused the portion of oil escaping, or being imperfectly decomposed, to be precipitated in an extremely fine state of division, and to be carried forward in the current of gas, which, on being commingled with the naphthalene-charged coal gas, acted in a similar manner to the oil spray; and that many works, on adopting the carburetted water-gas process, had found the difficulties from naphthalene disappear, more particularly when the plant was operated so as not to lead to an excessive cracking up of the oil.

Since the date of that correspondence, a large amount of matter has appeared in your pages dealing with the naphthalene problem, much of which has a direct bearing upon the views then expressed. In the light of this matter, it may be interesting to revert to the subject; the direct motive prompting me to do so being the letter of Mr. C. F. Botley in your issue of the 8th inst., in which he takes exception to the remarks made in the "JOURNAL" for the 1st inst. as to the relative cost of the process of washing the naphthalene-charged gas with creosote oil in the Dessau experiments and at Hastings.

The Dessau experiments show that, in order to obtain freedom from naphthalene deposits, it is necessary to use 176·4 lbs. of tar oil to wash 706,000 cubic feet of gas, or equal to nearly 0·25 lb. per 1000 cubic feet of gas. Mr. J. P. Leather, in his paper read before the Gas Institute, stated that 200 gallons of oil will dissolve the naphthalene out of 10 million cubic feet of gas, or equal to about 0·21 lb. per 1000 cubic feet. Mr. Botley states that a gallon of oil will "fog" or spray 128,000 cubic feet of gas, which would be equal to 0·062 lb. per 1000 cubic feet, or rather less than one-third of the quantity of tar oil which it has been found necessary to use at Dessau or Burnley.

The analysis of the deposited oil from the Hastings works main, given in Mr. Leather's paper, and his remarks upon the Hastings process, leave little doubt that the process is essentially what I have stated it to be—a scrubbing process carried out in the mains and services. There is, however, the material difference between the systems that, in the oil-washing process, as carried out at Dessau and at Burnley, the naphthalene is dissolved out of the pure coal gas as it is manufactured before storage, whereas at Hastings the oil is only brought into contact with the gas as it leaves the works for consumption; and as the gas at Hastings is in part carburetted water gas, the solvent oil necessarily comes in contact with the mixed coal and carburetted water gas.

An examination of the saturated solvent oils from the two processes is exceedingly instructive, as to the nature of the function which the oil performs under these different conditions. In the Dessau experiments, the 176·4 lbs. of tar oil, with 5·3 lbs. of benzol added, on being employed to wash the gas, absorbed about 10 per cent. of naphthalene, and there was obtained 198·4 lbs. of oil saturated with naphthalene; so that practically the sole action of the tar oil was to dissolve naphthalene out of the gas. The analysis of the deposited oil from the Hastings works main, as given in Mr. Leather's paper, was as follows:—

5	per cent.	boiling below 212° Fahr., chiefly benzene.
2	,, ,,	between 212° and 250° Fahr., chiefly toluene.
5½	,, ,,	between 250° and 300° Fahr., chiefly xylene.
10½	,, ,,	between 300° and 380° Fahr., of which nine-tenths were cumene or other substances of the benzene series.

About 5 per cent. by weight was naphthalene.

Mr. Leather also says:—

A comparison of the analysis of the original Tea Rose oil used at Hastings with the oil deposited after use, discloses an interesting fact, which might indeed have been expected from the well-known laws of solution of vapours in gas. Tea Rose oil begins to boil at about 250° Fahr., and 50 per cent. of the oil boils below 460° Fahr. The deposited oil only contains about 45 per cent. boiling below 460° Fahr., and nine-tenths of this portion consists of aromatic hydrocarbons not originally contained in the Tea Rose oil. It follows from this that 100 parts of oil sprayed into the gas give up 45 parts in the form of vapour, and absorb 40 parts of benzene and other aromatic vapours from the gas.

It may be safely assumed that the portion of oil which is sprayed into the gas in such a fine state of division that it is only deposited after it leaves the works, or is carried through the consumers' burners, will have a somewhat similar composition to that precipitated in the works. Although, therefore, both processes are oil scrubbing or washing processes, it is evident, from the composition of the oils before and after being used to wash the gas, that the conditions of washing are much modified by the character of the washing oil and the constitution of the gas to be washed, as also the method of applying the oil.

When an oil composed of various hydrocarbon fluids having different vapour tensions is brought into intimate contact with a gas holding the vapour of hydrocarbons which have different tensions and are more or less soluble in the liquid oil, a balance is rapidly effected between the diffusion of the vapours from the liquids and the solution of the vapours diffused through the gases by the liquids; this balance being the mean of the tensions of the vapours of the various hydrocarbons in the gas and in the liquids, and the relative proportions of each present. There is, therefore, a fixed relation between the hydrocarbon vapour diffused through a gas and the hydrocarbon liquid with which it was last in contact; and, *vice versâ*, the constitution of a hydrocarbon fluid which has been brought into intimate contact with a gas will have a similar relation to the vapour left diffused through the gas with which it was last in contact.

In the process of washing with coal tar creosote oil from which the naphthalene has been separated and to which a portion of coal tar naphtha has been added, the gas is brought into contact with the very same hydrocarbons as those with which it had been last in contact during the process of condensation. The balance of vapour tension and solubility had, therefore, been already adjusted, with the exception of that of naphthalene, which having been removed from the creosote, the latter dissolves the naphthalene diffused through the gas till a balance is established; and as the creosote oil can be applied to the gas in a fractional manner, just as water is applied to dissolve the ammonia out of the gas, the solvent creosote oil free from naphthalene is first brought into contact with the gas that has been nearly freed from naphthalene, and thereafter into contact with more and more highly-charged gas, till the oil is saturated with naphthalene before being drawn off from the lower compartment of the washing vessel. The quantity of naphthalene that can be absorbed by the creosote oil before a balance is established is very large; being in the Dessau experiments about 10 per cent., and in the trials at Burnley about 15 per cent. The reason for the solvent power of the creosote oil being almost entirely confined to the dissolving of the naphthalene is thus made evident.

The conditions obtaining in the spray-washing process at Hastings are in many respects different. The hydrocarbons contained in the sprayed oil belong to a different series from those with which the gas has been last in contact; and the gas is not pure coal gas, but a mixture of coal and carburetted water gas. The scrubbing oil is not, nor can it very well be, applied fractionally to wash the gas. Under these altered conditions, before a balance of vapour tensions and solubilities in relation to their proportionate quantities can be established, a considerable quantity of the sprayed oil, having a similar high vapour tension to that of the gas, must pass into the gas, while the denser part of the sprayed oil must have its solvent affinity for the vapour diffused through the gas satisfied.

The analysis of the deposited oil given by Mr. Leather shows that this had been the action of the sprayed oil in the presence of the gas. Not only so, but it reveals the constitution of the hydrocarbon vapours which must have been diffused through the gas with which it had been in contact, as the vapour in the gas will be present in the deposited oil in proportions having a relation to their vapour tensions and the quantities diffused through the gas. Mr. Leather's analysis shows that the gas washed by the sprayed oil must have had diffused through it a large volume of vapours boiling between 250° and 380° Fahr., chiefly xylene, cumene, or other substances of the benzene series—the very hydrocarbons which are best suited to prevent naphthalene being deposited in the solid form, being both good solvents for, and having vapour tensions approaching that of naphthalene. A gas containing such a quantity of these hydrocarbons as is indicated by the deposited oil would require no oil washing to prevent it depositing naphthalene in the solid form.

These hydrocarbon vapours could not have been those present in the gas from coal carbonized at high temperatures, as they are the fractions which are largely broken up at high temperatures; their constituents being re-arranged to form benzol, naphthalene, and some other high-temperature hydrocarbons. They must therefore have come from the carburetted water gas. That such was in all probability the source, is supported by statements made in the paper on the "Practical Working of Carburetted Water Gas," read by Mr. Charles F. Botley at the last meeting of the Institution of Gas Engineers (see "JOURNAL" for May 16, p. 1278), and the discussion that followed, from which it can be gathered that the oil used in carburetting the water gas at Hastings was not decomposed to an excessive extent, and that the condensable hydrocarbons came forward through the purifiers, and mixed with the coal gas.

It may be that the sample of deposited oil from the Hastings works main examined by Mr. Leather was not of a normal character; but if it was, it would indicate that the freedom from naphthalene deposits experienced at Hastings is largely due to the action of the hydrocarbons present in the carburetted water gas. This view is still further strengthened by the facts regarding the quantities of naphthalene likely to be present in gas produced from coal carbonized at high temperatures, and the quantities of liquid hydrocarbons required to take up such naphthalene in solution from the gas, as given in the papers of Dr. P. Eitner and and Mr. W. Irwin which have recently appeared in the "JOURNAL." Further, if at Burnley and at Dessau it required from 3 oz. to 4 oz. of creosote oil per 1060 cubic feet of gas to obtain freedom from naphthalene deposits, it is difficult to believe that a single ounce of Tea Rose oil—an inferior solvent—will have the like effect when used as in the Hastings process. It is therefore reasonable to infer that a part of the work of preventing the naphthalene troubles is due to the carburetted water gas, and this part should be credited in estimating the cost of the process.

Priorsford, Peebles, Aug. 18, 1899. WM. YOUNG.

Water Consumption and Waste.

SIR,—With respect to the article on "Consumption of Water per Head," &c., pp. 268-9, by "A Distributing Engineer," I am surprised at his disparaging remarks anent the inspector, who, he says, goes from house to house to washer taps *gratis* or for a shilling per annum. I should imagine an engineer knew the inspector's duties better than that. Your correspondent places the Venturi meter far before the inspector, and seems to regard it as infallible. Now, for my own part, I cannot agree with him; for I do not think that meters of that description are at all necessary where the engineer can approximately gauge his output, and where practical and experienced waste-water inspectors are employed. The duties of an inspector should be to examine and test all supplies

(lead or metal) for bursts, examine all existing fittings for waste, report same, and take the necessary measures for having any defects found by him speedily remedied. If "Engineer" could only spend a short time with an experienced inspector, he would be surprised at the numerous causes of waste that can be so detected. I myself have found hundreds of lead, and many metal pipes, which have burst under ground, and which have not so much as damped the earth above; and this kind of burst, I believe, is the chief cause in many towns of so large a consumption. As the President of the British Association of Water-Works Engineers stated, the fact that all gathering grounds are being quickly appropriated will cause the engineer to give greater attention in the future than has been so far given to the prevention of waste, for, no matter how good their quality, fittings and pipes used in the distribution of water, like all other things, are bound to get out of order. If the inhabitants of towns knew that a capable staff of inspectors were employed, many of the scandalous and fraudulent misuses of water complained of by "Distributing Engineer" would cease to exist. I maintain that it is the duty of the engineers to educate and raise the level of the present-day inspectors, as has been done in the building, sanitary, and other professions.

A Waste Inspector.

Aug. 15, 1899.

Sir,—The questions raised by "A Distributing Engineer," in the "Journal" for the 8th inst., are numerous and full of interest. When a source of water supply is being selected, the rate per head per day fixed by the engineer for the population to be supplied will include all trade and domestic requirements; but if the consumption of one town is to be compared with that of another, the basis of calculation for this rate cannot with any reason include trade supplies. If, then, trade supply is to be excluded, what shall the domestic supply include? Shall the total supply less the metered supply be divided by the population, or shall we, as is done in some cases, take all metered and unmetered trade supplies away before such division is made? It would be a gain if engineers could decide definitely what the expression "rate per head per day" is to mean. It often unjustly becomes the scapegoat for the sins, known and unknown, of all parts of a water undertaking. Waste during additions, alterations, and repairs, unaccounted-for slip of pumps, waste of pumping-stations, percentage slow of meters—all these find an unrighteous haven in "rate per head." It is the panacea for all such leakages, besides waste.

Even though a uniform basis of calculation could be agreed upon, there are still, as the writer of the article points out, wide differences in the habits and requirements of different places, which make it next to impossible to compare the rate per head town with town. No doubt it is correct that some towns use so much water for ornamental purposes that this rate is materially influenced thereby; but the more general cause of difference lies with the closets. It is not so much whether a two or a three gallon flush is allowed, great as is the difference which this would make, as whether the apparatus is of the most efficient type to prevent waste, and is properly kept in order. When it is found that 3000 gallons will waste per diem through a single water-closet, simply by an outlet-valve being thrown off its seat, heavy rates may easily be accounted for where closets are common. This is only one among many similar points which might be mentioned.

One subject to which "A Distributing Engineer" alludes needs much ventilation: "How shall the water sent for distribution be measured?" Where the water is pumped, the theoretical capacity of the pumps, less a very slight percentage for slip, is generally the quantity relied upon. This is often very incorrect. Valves and cocks frequently become faulty; some engines vary considerably in their efficiency; and the waste necessarily incurred at a pumping-station during repairs and alterations is often great. But none of these should come to the distributing department for calculation. No doubt an efficient meter, such as the Venturi has proved itself to be, is the most proper system to start with. Knowing then the actual quantity of water he has to deal with, the distributing engineer will soon know how it is disposed of, and what proportion of his rate per head per day must be accounted as waste.

One thing it is well to bear in mind. The quantity of water required for purely domestic purposes is steadily on the increase, and will become larger as the habits of cleanliness of a community improve. Let people be encouraged in the rightful use of water, but let every effort be put forth to prevent waste. If consumers could be taught to "waste not," the water-works engineer would generally be able to say they should "want not."

H. S. H.

Aug. 18, 1899.

Theft of Gas.—A man named Frederick Jackson, a shoemaker, of Glossop, was charged with stealing gas the property of the Glossop Gas Company, and with making connections to their mains contrary to their Act of Parliament. It seems that some bottled beer was missing from a working men's club next door to where the accused was living; and while the police were making an investigation of his cellar under a search warrant, they found that defendant had surreptitiously connected a pipe to the gas-main. Mr. Tweedale prosecuted on behalf of the Company, and asked for the maximum penalty to be imposed. It was proved that the defendant had not had a meter in his house for eight years, and had not paid for any gas during that time. The Bench fined defendant £4 and costs, with the alternative of two months' imprisonment.

Chapel-en-le-Frith Water Supply.—At the meeting of the Rural District Council of Chapel-en-le-Frith on Monday last week, a letter was read from the Local Government Board asking to be informed what had been done as to the public water supply of the parish. The Clerk read correspondence which had passed with Messrs. A. & G. W. Fox, Solicitors, of Manchester, acting on behalf of the two Companies who are responsible for the supply. One offered to lease their works to the Council for 21 years at such a rental as would pay 4 per cent. on the capital; while the other held that their water was good. Mr. Hyde advocated the purchase of the concerns by the Council, as the authority responsible for the health of the inhabitants. He said the water had been condemned by the report of the County Analyst. As a number of the Councillors were interested in the Companies, he gave notice to move that the Local Government Board be asked to hold an inquiry into the matter. It was decided to press the Companies for a decisive reply; and also to inform the Board of the present situation.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GASLIGHT COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday—Sir Edward Lawrence in the chair—when the report (*ante*, p. 438) and accounts for the past twelve months were submitted.

The Chairman, in moving the adoption of the report, thought the shareholders would all admit that the accounts were eminently satisfactory from whatever point of view they were regarded. With reference to the revenue account, the proprietors would see that the Company had expended for material during the past year £5118 more than they did in the preceding year. This arose from the additional quantity of gas made, as more oil had been used than in the preceding year; and also from the additional price they had to pay for coal, which was 14s. per ton, as against 13s. 8d. The amount of coal carbonized was only 287,148 tons, as against 302,068 tons in the previous year. This was because the Company had made more carburetted water gas, and therefore did not require the same amount of material for the production of coal gas. The items for repairs and maintenance of works and plant in the manufacture of gas, showed an increase of about £17,000; and there was also an increase of £3460 for the repair, maintenance, and renewal of mains. On the whole, there had been an increase in the expenditure for the year of £25,532. On the other side of the accounts, they would be glad to see that the amount realized from the sale of gas to the public was £12,204 more than in the previous year. In respect of ordinary gas consumers, there was an increase of 2·16 per cent.; of automatic meters, of 16·32 per cent.; and of public lamp lighting, of 0·7 per cent.—the increases taken together being 2·62 per cent. In face of what they had gone through as regarded active competition, this was a most satisfactory result. The total quantity of gas supplied during the year was no less than 3,373,735,000 cubic feet. It was almost difficult to realize what these figures conveyed; but it was enough for them to know that the consumption of gas, in spite of the competition with the electric light, was steadily increasing. Even since June 30, when the accounts closed, the increase had gone on in a still greater ratio. As to residuals, there was a rather extraordinary result. Coke had produced no less than £13,523 in excess of the previous year; the price obtained being close upon 7s. 8d. per ton, as against 4s. 7d. per ton. It was difficult to account altogether for this; but his own impression was that it was the result of good trade in the country, and that as long as trade was flourishing (as it was now almost without exception) so long would gas companies take their full share of the benefits accruing. With regard to tar, there was a slight deficiency, which he did not anticipate during the present year. As to ammoniacal liquor, they had received £4481 more than in the preceding year; the price realized being 50s. 10d. per 1000 gallons, against 36s. 5d. He hoped and believed that in the coming year all three items of residuals would show a very considerable amount in excess even of the year which recently closed. The result of all these figures was a net profit to the Company on the working of the year of £118,793. Out of this they paid for interest £13,567; and the dividend recommended would absorb £104,967—leaving a surplus of £258. The estimates for the future, which their competent officials had placed before them, had invariably been fully realized; and he was glad to say that the estimates now were such that they felt they could safely venture to recommend the proprietors to reduce the price of gas from 2s. 9d. to 2s. 8d. per 1000 cubic feet during the ensuing year. This would bring down the price of Liverpool gas to the lowest point it had ever reached. He would like, if possible, to see it lower; and if the trade of the country continued to progress as it had done, it was quite possible that some day his hope might be realized. At all events, for the present they trusted that their customers would be well satisfied with the reduction, and that the shareholders would feel that the Directors were doing everything they could to protect the interests both of shareholders and consumers. He could not impress upon them too strongly that the Directors fully realized their responsibility to do everything in their power to give both consumers and shareholders the fullest benefits to which they were entitled. In the economical administration of their affairs, everything was going on most satisfactorily; and he was quite sure that both Mr. William King, their Engineer, and Mr. J. F. Robinson, their Treasurer, were in their respective departments entitled to the thanks of the shareholders and of the public—if they would only look at it in that light—for the care they exercised in discharging faithfully the responsible duties entrusted to them. Seeing that their property was kept up to the mark, and was in the most perfect order, they were prepared, as they had always been, to face any reasonable and fair competition; and he thought that experience showed more and more that they had nothing to fear from competition which every year became more acute. Their property was as valuable as it had ever been, and he could assure the meeting the Directors were prepared to do everything in their power to treat with justice both the shareholders and the public. During the past year, they had been enabled to establish a system of superannuation for their staff; and he trusted that it would not only be another means of welding together employers and employed, but that it would show they were doing all they could to promote the well-being of those upon whose services they so materially depended.

Mr. J. Lister seconded the motion, which was adopted unanimously, as was also another resolution declaring the payment of the dividends mentioned in the report.

Sir Edward Lawrence, Messrs. J. E. Tinne, G. H. Ball, and T. Comber were re-elected Directors; and Mr. James Handley was appointed an Auditor in the place of Mr. J. R. Darsie, resigned.

A vote of thanks was passed to the Chairman and the Directors for their services during the year.

Sales of Shares.—Messrs. Shepherd and Son recently sold by auction 97 fully-paid £10 shares in the Littleborough Gas Company—90 at £25 2s. 6d. each, and the rest at £25. Last Tuesday Messrs. Lalonde Bros. and Parham submitted to public auction 200 "D" shares, of the nominal value of £20 each, in the Weston-super-Mare Gas Company, which were disposed of at an average of £33 15s. per share; the highest price being £35, and the lowest £33.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) having read the notice convening the meeting, the report and accounts, summarized last week, were presented.

The CHAIRMAN said it was his pleasure to move the first resolution on this the occasion of their 105th half-yearly meeting—viz., "That the report and balance-sheet submitted by the Directors should be approved." He had the greatest possible pleasure in proposing this resolution, because he had to present to the proprietors one of the best balance-sheets, he thought, that had been submitted to them since he had been a Director of the Company, and certainly since his colleagues did him the honour of placing him in the position of Chairman. Referring to the report, he said that naturally the first thing the Directors alluded to was the increase in the consumption of gas, which was always a matter of anxiety to the Directors of any gas company. The total quantity of gas sold showed an increase of 3·62 per cent. on that of the corresponding period of 1898; and, taking into consideration the past very mild winter, this increase must, he thought, be regarded as very satisfactory. But, curiously enough, the greater portion of it had occurred during the latter part of the half year—a fact which might be accounted for because it had been so extremely hot that a great many more people had used gas for cooking purposes. He thought he could give the proprietors some figures which would show how very satisfactory the increase in the consumption of gas had been in the past. As compared with five years ago—in 1894—the increase had been 30 per cent. on the gas sold. This must be considered as highly satisfactory, showing as it did that, although they had to compete with the Corporation, who had laid on the electric light in many thoroughfares, whereby the Company had had to take down a great many street-lamps, they were still able to maintain a satisfactory increase in the sale of gas. The next thing the Directors dealt with in the report—and it was one which was always a very important matter with any gas company—was the question of residuals. Here again the increase had been extremely satisfactory, as, with one exception, there had been a great advance in price. The exception was in the case of tar, with regard to which there had been a small decrease. Coke had realized 1·39d., or nearly 1½d., per hundredweight more than in the corresponding period of last year; breeze showed nearly 1d. increase; and sulphate of ammonia no less than 13s. 6d. per ton more. This, as they might imagine, had added very considerably to the profits in the half year. Then in regard to the number of ordinary consumers of gas there had been an increase of 161, and of 458 prepayment and automatic meter consumers; bringing the total up to 13,880. Going back five years again, they would find that the number of consumers had augmented 65 per cent., which he thought must be considered highly satisfactory. In cooking and heating stoves there had been an addition of 445 in the half year. But if they took the number five years ago, they would find an increase of no less than 119 per cent. in the cooking and heating stoves supplied and fitted up on the hire principle; the total number at present on hire being 5761. Turning to the capital account, they had expended £3133 14s. 5d. during the half year, which was very much less than in many former periods, simply because they had gone on in the ordinary way of putting down mains in roads and buying an extra stock of stoves to meet the demand. They had laid mains in 23 roads, which, with other works connected with distribution, &c., amounted to £890; new meters had cost £479 9s. 3d.; and new gas-stoves, £1258 10s. 6d.; while for new house fittings they had paid £505 13s. 11d.—the total amount of capital expenditure being, as he had said, £3133 14s. 5d., making a net total of £376,650 1s. 1d. This would have been more, but they had written off £1000 from the Carshalton Gas-Works. They abandoned those works because they found that they could make all the gas required at Croydon, and send it through a trunk main, instead of having two manufacturing stations; and he thought the result showed that the Directors were right in this matter. Dealing next with the revenue account, he said the total receipts had been £62,261 3s. 11d.; the most important item being the sale of gas to private consumers—£35,526 13s. 11d. in the Croydon district, and £4144 12s. 1d. in the Carshalton district. The revenue from public lighting had been £6086 14s. 5d. These figures gave them an increase in the sale of gas equal to 3·62 per cent., as he had already stated. Then they had an advance in the price of residuals of no less than £3121 over the corresponding half of 1898. The total expenditure on revenue account had been £45,448 9s. 4d.; leaving a balance of £16,812 14s. 7d. to be carried to the net revenue account for the dividends. Added to this they had £1384 3s. 1d., which was carried forward as a balance from the last account, and interest on the reserve fund £372 1s., which made a total of £18,568 18s. 8d. Out of this they had had to pay interest on their dividends and other incidental matters; they had also placed £500 to the reserve fund, and £250 to the insurance fund. They believed it to be a wise course, when they had a good balance-sheet, to strengthen their reserve fund, in case they might want it at any time. They had taken into consideration very seriously the question whether or not they should reduce the price of gas; but as their good contract for coals expired, he was sorry to say, in June, and as, like all other companies, they had to pay a higher price, and seeing, too, that it was uncertain as to whether the higher returns obtained for residuals could be kept up, the Directors thought it would not be wise, on the present occasion, to lower the charge for gas. Then, again, castings had gone up very much indeed, and other things in proportion. The net result of the figures in the accounts was a balance of £17,021 available for division. Out of this the Directors proposed to pay the usual dividends, which would amount to £15,447, and leave a balance of £1574 to be carried forward. This, he thought, must be considered satisfactory by all the shareholders present. Their men, he was pleased to say, had, during the trying weather and excessive heat, stuck to their work extremely well; and he was sure the Directors and all the proprietors appreciated that, and felt that they deserved their thanks.

Mr. A. J. LAMBERT seconded the motion.

Mr. HAYTON asked the Chairman if he could give the meeting some idea when the price of gas would be reduced to Carshalton consumers.

The CHAIRMAN replied that when they took over the Carshalton works in 1894, the price of gas was 4s. 6d. per 1000 cubic feet. They levelled it down 1s., and since then it had been lowered another 1d.; and as the price was reduced in Croydon, there would be a corresponding reduction in Carshalton. But by their Act the price in Carshalton was not to exceed 1s. more than that charged in Croydon, and not to be less than 6d. more. This was fixed for ten years; and there were five more years to run. But everything they could do for Carshalton should be done.

The motion was carried unanimously.

Mr. CORBET WOODALL then proposed that the usual dividends at the rate of 14, 11, and 9 per cent. per annum upon the respective stocks be paid. He said he had much pleasure in doing so, because, as the Chairman had already remarked, the report and accounts showed the dividends had been fully earned, and there was something over. It might have struck some shareholders, in looking through the accounts, that while the income of the Company was some £5000 more than it was in the corresponding half of last year, the expenditure had increased to nearly the same amount; and consequently the balance carried forward was almost identical with what it was last year. This would seem to tell a story of increased expenditure in a greater proportion than revenue; and, on the face of it, this was the case. As a matter of fact, the Directors had been able, in the half year under review, to undertake a very great many works of renewal paid for out of revenue; and these were all in the direction of reducing the proportion of capital to business done, which was the best way of ensuring the permanent prosperity of the Company. They had spent in the half year £2500 on repairs to works, and £1200 on repairs to mains. These sums had been expended in taking up small pipes and laying larger ones, and replacing comparatively worn-out machinery by new of a better type. There had been no charge to capital of anything which could be fairly and properly charged to revenue. He was delighted to hear the practical promise of an early reduction in the price of gas. He believed they were in a position to thoroughly support the Chairman in his *quasi*-promise; and before very long they might expect a reduction in price. He was quite sure that their friends at Carshalton would not be left out when the reduction had to be made. The dividends were now paid free of income-tax. As the shareholders were aware, they were entitled to divide more dividend than they distributed. In ordinary circumstances, the payment of dividend free of income-tax was hardly justifiable; but in their case it was strictly so.

Mr. T. RIGBY seconded the motion; and it was at once agreed to.

Mr. BAINES moved a cordial vote of thanks to the Directors for their continued good management of the undertaking. With regard to their insurance and reserve funds, they naturally wanted to be on the safe side; but he had been considering whether they had not almost reached the maximums.

Mr. WOODALL pointed out that the insurance fund was still £2000 short of the sum allowed by Parliament.

Mr. ELLIS seconded the motion, which was unanimously agreed to.

The CHAIRMAN replied, and proposed a hearty vote of thanks to the Engineer and Manager (Mr. J. W. Helps), the Secretary, and the staff; and it was agreed to.

Mr. RUSSELL, in returning thanks, assured the proprietors that he took the greatest interest in the Company; and he hoped he should never do otherwise. No man could be better served than he was by his staff of assistants.

Mr. HELPS also replied, and said the men at Waddon would be delighted to know how much their services were appreciated by their employers. Proceeding, he said the Chairman had brought under his notice a circular issued from the borough electric lighting works; and he had asked him to make a few remarks concerning it. The circular said: "With the reduction of price"—whatever that might be—"which has just taken place"—*i.e.*, for the electric light—"it costs no more than gas." Now, the price of gas in Croydon was 2s. 8d. per 1000 cubic feet; and a simple calculation would show that, in order to compete with gas consumed through the ordinary argand burner, electricity would have to be sold at not more than 3d. per unit. He did not think it would be sold at so low a rate as this for a very long time. If electricity had to compete with incandescent gas, however, it would have to be sold at ⅜d. per unit. To put it even more clearly, 2s. 8d. worth of gas consumed through an argand burner was equal in lighting value to 6s. worth of electricity; while in the case of incandescent gas, 2s. 8d. worth was equal to 24s. worth of electricity. (Laughter.) The Directors thought it was only due to their consumers that they should know that the statement made by the electric light people was somewhat incorrect.

This concluded the business of the meeting.

BROMLEY GAS CONSUMERS' COMPANY.

The Boundary Dispute—The Case to be Carried to the Appeal Court.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Royal Bell Hotel, Bromley—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) having read the notice convening the meeting, the report and accounts for the six months ending June 30 last were presented. The report set forth that there had been an increase of nearly 3 million cubic feet in the make of gas, as compared with the first half of last year. A new house and plant for manufacturing sulphate of ammonia had been constructed. Contracts for coal had had to be renewed at advanced rates; but better prices obtained for coke and sulphate of ammonia. The profit and loss account showed a balance of £8613; and the Directors recommended the declaration of dividends, under the sliding-scale, at the rate of 12 per cent. per annum on the original 10 per cent. capital, and 9 per cent. per annum on the ordinary 7 per cent. capital. This would absorb £6465, and leave a balance of £2148 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, remarked that he thought the gas industry throughout the country had improved its position considerably during the present year. The somewhat extraordinary wave of activity which had pervaded all trades and industries had apparently also included the gas industry; and so they found that, notwithstanding the very bright and warm weather of the past half year,

with the exception only of two or three weeks in March, which were of the usual character of spring weather, they had an increase in the consumption of gas of nearly 3 million cubic feet, which was very satisfactory. Their works were in excellent order, and of abundant capacity, not only for the manufacture of all the gas that they were likely to want for a time, but also for dealing with residuals, the transport of which they had endeavoured to facilitate by buying their own railway waggons. Then coal, owing to its having been so universally in demand, in consequence of the increased trade, had advanced considerably in price; but the same cause which had tended to the enhancement of the value of coal had increased the value of coke. They found, therefore, that, while their coal had cost them something like £866 more in the half year, they had received from the sale of coke at better prices an additional sum of £774. Then on the rental side the improvement in the price of sulphate of ammonia had brought them another £375, and tar also yielded a further £162. These amounts, with the additional rentals from gas and meters—£506—gave them a total advantage of £1815 in the gross income for the half year. Against this they had an increased outlay for coal and purifying material of £941; and then if they put together the additional cost of repairs and renewal of meters, services, stoves, and fittings on hire, and public lamps, they found a net increase of £120. They had had to pay £50 more in rates and taxes, while establishment charges and bad debts had only involved another £40. Thus the increased expenditure amounted to about £1150, leaving them with a net advantage on the half-year's trading of £660, which he thought they would consider very satisfactory. Before arriving at this sum, they had also made liberal deductions for depreciation of machinery, retorts, and more or less perishable plant of that kind, which they would find included, though not expressly so stated, in the amount of £1702 which appeared under the heading of manufacture. Thus the Directors were able to recommend the continuation of the satisfactory dividends of 12 and 9 per cent.; carrying over the surplus to the next account. The last issue of new shares realized very satisfactory prices; the average being £21 per share. So with regard to their business they were progressing, he thought he might say, very well indeed. Perhaps it might be expected that he should refer to the matters which had recently been *sub judice* between the Crays Gas Company and themselves. Through the enterprise of the Press, they were already furnished with an extract from the judgment, which gave the shareholders a general outline of the case in its first stage. It was therefore quite unnecessary that he should dwell upon it in detail. Indeed, he thought it very undesirable that he should do so at the present time, as the matter was not closed. The Company had been advised by their Counsel and Solicitors that the case should be carried to appeal. The Directors had carefully considered the position created by the judgment; and they unanimously decided to act upon this advice. Therefore, as the matter was not settled, he asked them to extend their confidence to the Directors, and to leave it where it was for the present—in their hands. Afterwards they would, he was sure, be well satisfied that, in the failure of their efforts to effect a settlement by agreement, which they earnestly tried to do, the state of things required that their rights and positions should be definitely ascertained before a competent legal tribunal, and an intelligible understanding established for the future out of the involved proceedings of the past, which, if the present decision were upheld, would permit an agreement to be made binding upon both Companies, without its completion and execution having been recorded on the minute-books of either Company, and without either being able to produce it, or part of it, or any draft of it.

Mr. B. Latter seconded the motion, and remarked that the business was going on very satisfactorily all round.

The resolution was then carried unanimously; and the dividends, as stated, were afterwards agreed upon.

Upon the proposition of Mr. W. Sutton, a hearty vote of thanks was passed to the Directors and officials of the Company. Mr. Sutton, in his remarks, expressed the hope that the Company would soon be able to make a reduction in the price of gas, so as to better compete with opposition.

The Chairman, in reply, said the Directors had that matter ever before them, and hoped at no distant date to be able to make some reduction.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

At the meeting of the Bath Gas Company on the 29th inst., the Directors will have the gratification of reporting that, notwithstanding the reduction of 2d. per 1000 cubic feet made in the price of gas at the beginning of the half year ending June 30, and after charging the law expenses incurred in what they characterize as the "unnecessary action of Messrs. Carr, of the Twerton Cloth Mills," the balance on the revenue account is £7592, and the interest on the invested reserve fund £285; making together £7877, or more than sufficient to pay the maximum dividends on the whole of the Company's stocks. There was an increase to the extent of 7 million cubic feet, or 3 per cent., in the consumption of gas during the past half year, caused in a considerable measure by the additional prepayment consumers using cooking-stoves. The revenue from the sale of gas amounted to £26,615; residuals produced £5942 (an increase of £1614); and the total revenue was £34,357. The expenditure on the manufacture of gas was £18,731; on distribution, £2674; and on management, £1515. The total expenses amounted to £26,765. The balance of net profit is £11,043; and the Directors recommend the payment of the maximum dividends. Under the supervision of Mr. C. Stafford Ellery, 17,928 tons of coal and 147,138 gallons of oil were employed in the manufacture of gas; the residuals produced being: Coke, 10,507 tons; breeze, 1133 tons; tar, 979 tons; and ammoniacal liquor, 537,000 gallons. The make of sulphate was 193 tons, of which 184 tons were sold.

In the accounts which the Directors of the Eastbourne Gas Company will submit to the shareholders on the 28th inst., the revenue account shows a profit of £6187 for the six months ending the 30th of June. Adding the balance brought forward (£10,841), and deducting £47 for interest, leaves £16,981 to the credit of the profit and loss account. The Directors therefore recommend a dividend at the rate of 14½ per cent. per annum on the original and "C" shares, and of 11½ per cent. per annum on the "B" shares. These payments will absorb £6093, and leave a balance of £10,888 to be carried forward. To meet the requirements of the growing business of the Company, and to pay off the present deficiency on capital account, it has become necessary for the Directors to obtain the sanction of the shareholders to the raising of further capital by the issue of new shares; and this will be asked for at a special meeting to be held at the close of the ordinary one.

The Directors of the Faversham Gas Company, in their report for the year ended June 30 last, state that there was a satisfactory improvement in the quantity of gas sold; the amount realized being £371 in excess of the previous year. Residual products were also £197 better. The net profit was £3798, out of which the Directors recommended payment of a dividend of 9 per cent., free of income-tax. At the annual meeting on the 9th inst., the Chairman (Mr. J. A. Anderson) moved the adoption of the report, and congratulated the shareholders upon another successful year's working. He said the increase in the quantity of gas made was upwards of 5 per cent. as compared with the preceding year. They were not yet able to push the trade in cooking-stoves, &c., because they had no gas to spare for the purpose. The Directors proposed extending the works, and had concluded a contract for the site of a new gasholder. Later it would be a question of enlarging their manufacturing plant. The report was adopted. A vote of thanks to the Chairman, the Directors, and the Manager (Mr. R. Darney) was afterwards passed, and duly acknowledged.

The half-yearly meeting of the Littleborough Gas Company was held on the 10th inst. According to the balance-sheet, the amount available for distribution was £2543, out of which the Directors recommended the payment of the usual dividend—10 per cent., less income-tax. The revenue account showed that the total receipts for the six months ending June 30 were £4889, against £4688 for the preceding half year; and that the expenditure was £3346, against £3001—leaving on the six months a profit of £1543, against £1687. The dividend recommended was declared.

The half-yearly meeting of the Newport (Mon.) Gas Company was held on Monday last week—Mr. E. J. Phillips in the chair. In moving the adoption of the report, the Chairman said it was satisfactory to meet the shareholders with so good a one. They had earned more than sufficient during the six months ending the 30th of June to pay the half-yearly dividends; whereas before, in consequence of the very high price of coal and other exceptional circumstances, they were obliged to dip into their reserve fund to the amount of some £3000 to assist in paying the dividends. But the past half year had been an exceptionally good one. Coal cost £192 less than in the corresponding period of 1898, when the figure was high in consequence of the strike; but it actually cost them more than the ordinary amount, and would probably continue to do so in the future. The balance was £5927, as compared with £4896; and they had improved nearly £1000 in the sale of gas. Of the entire revenue, 6 per cent. was due to the consumption of gas in cooking-stoves and slot meters. During the preceding fortnight, as compared with the corresponding period of 1898, there had been an increased consumption of 1¼ million cubic feet of gas; and, on the whole, he thought they had every cause for congratulation. The report of the Engineer (Mr. T. Canning) showed that during the half year they had made 130 million cubic feet, as against 123 millions in the first half of 1898; and it was satisfactory to know that a great part of this increase took place during the summer, when they did not usually expect it. They now had a competitor; but they were making very good progress in spite of electricity. He understood that the Corporation were about to extend their mains; and he pointed out that the wiring of 70 miles of streets could not be done for less than about £84,000. To some extent municipal trading was an unfortunate thing, for public bodies could put their hands into the ratepayers' pockets, and did not always look to see if their trading would be remunerative. So far, however, as their Corporation were concerned, he thought they were as careful as any municipality could be. For the success of any undertaking they were under great obligations to the officials, and it was only fair that they should acknowledge their indebtedness to the Engineer and the staff generally. Mr. R. Laybourne seconded the motion; and it was carried unanimously. Dividends on the various classes of stock of 5, 3¾, 3½, and 2½ per cent. were then declared for the six months ending June 30; and the proceedings closed.

The eighty-fifth half-yearly meeting of the Ossett Gas Company was held last Thursday, when the report presented showed a profit balance on the six months' working of £2057. Out of this it was recommended that the usual dividends of 10 and 7 per cent. (less income-tax) be paid, and £368 added to the reserve fund. The consumption of gas showed an increase of nearly 5 per cent. over the corresponding period of last year. The Chairman, in proposing the adoption of the report, alluded to the public audit of the Company's accounts, ordered by Quarter Sessions, on the application of the Ossett Corporation (see *ante*, p. 61). He said the Auditor's report showed that the accounts were correct; but the Company were mulcted in costs through having paid dividends without deducting the income-tax.

In moving the adoption of the report at the half-yearly meeting of the Peterborough Gas Company last Wednesday, the Chairman (Mr. W. Harris) remarked that the reduced price of gas—2s. 11d. per 1000 cubic feet—was very low indeed for a town of the size of Peterborough. At the time the reduction was made, the Directors did not anticipate an advance of 2s. per ton on the former contract for coal, which was equal to a loss of income for the year of between £800 and £900. There had been an extended demand for cooking-stoves. The maximum dividends were declared.

The ordinary general meeting of the Rochester, Chatham, and Strood Gas Company was held on the 10th inst.—Mr. T. Winch in the chair. The Directors reported that during the half year ending June 30 the affairs of the undertaking had been of an uneventful, but progressive, character; and they were pleased to be able to announce that the balance to the credit of the profit and loss account was sufficient to pay the full statutory dividends. The statement of accounts presented showed a total income of £33,451; a total expenditure of £30,445; and a net profit of £3006. The report and accounts were adopted, as was also the Directors' recommendation that a dividend at the rate of 10 per cent. per annum on the "A" and "D" shares, and of 7 per cent. per annum on

the "B" and "C" shares, should be declared. The whole of the Company's plant, under the supervision of Mr. J. M. Veevers, the Engineer and Secretary, was certified to be in very efficient condition.

The half-yearly meeting of the Yeadon and Guiseley Gas Company was held last Wednesday—Mr. W. King (Chairman) presiding. The Directors' report, read by the Secretary (Mr. E. Lister), stated that, notwithstanding the mildness of the weather during the early months of the year and the continued depression in the trade of the district, the sales of gas showed an increase of about 10 per cent. compared with the corresponding half of last year. There had also been progress in the other departments of the business. The contracts for the supply of coal for the current year were higher by at least 1s. 6d. per ton on every class. There were now 272 prepayment meters in use—an increase of 109 during the past twelve months. The revenue account showed a profit of £1253; and after payment of the maximum dividends at the rates of 10 and 7 per cent. per annum on the two kinds of stock, there was a balance left of £50 14s. 4d., which would probably be carried to the old retort rebuilding fund. A resolution was passed adopting the report and declaring the dividends named. At the conclusion of the ordinary meeting, an extraordinary meeting was held, at which resolutions were passed empowering the Directors to issue stock, under the Company's Act of 1880, to an amount not exceeding £10,000, and converting the present 7 per cent. shares into stock.

Water.

At the meeting of the Brymbo Water Company to-day (of which Sir Theodore Martin, K.C.B., is Chairman), the Directors will report that during the year ending the 30th of June 60 additional houses were connected with the Company's mains; making the total number supplied 3438. The domestic supply accounts show an increase of £35 on the previous year; and those relating to the trade supply, an increase of £96. The balance from last year's accounts was £126; and the net revenue receipts for the present year are £2050—together, £2176. Deducting the interim dividend paid on the 1st of March, £645, and the interest on the debentures and loans, £469, there remains available for distribution £1062. The Directors recommend that a dividend at the rate of 4 per cent. per annum be declared for the second half of the financial year (free of income-tax), and that the sum of £202 be carried forward.

At the half-yearly meeting of the East Worcestershire Water Company on the 31st inst., the Directors will report that during the six months ending June 30 last 101 additional services were laid on; making the total 5230, exclusive of Droitwich and Rednal. The average daily consumption of water was 638,872 gallons. The accounts accompanying the report show a profit of £1793, to which has to be added the sum of £1293 brought forward; making a disposable balance of £3086, which it is proposed to appropriate as follows: To pay a dividend for the half year at the rate of 4 per cent. per annum, free of income-tax, £1233; to add to the depreciation reserve fund £1000; and to carry forward the balance of £853. Renewals of plant and machinery being charged to capital expenditure, the Directors have found it expedient to recommend a moderate increase in the amount carried to reserve.

In the report to be presented by the Direc'ors of the Woking Water and Gas Company at the half-yearly meeting on the 29th inst., they state that the balance at the credit of the profit and loss account is £2549, out of which they recommend the payment of a dividend at the rate of 4 per cent. per annum for the past six months, free of income-tax, which will absorb £1565, and leave £984 to be carried forward. Reference is made to the fact that the Bill sanctioned by the shareholders on the 14th of February last, as amended in Committee, received the Royal Assent on the 1st inst. It empowers the Company to carry out new works, and authorizes an extension of water limits and an increase of capital. Under its provisions, the Company will be allowed to draw from the Thames such quantity of water as they may require for supply within their extended limits, not exceeding a million gallons in any day. Subject to certain restrictions, the Company are further empowered to take water in excess of the above quantity; but the whole is not to exceed 3 million gallons a day. In respect of the exercise of the privileges so conferred, the Company come under liability for payments to the Conservators of the River Thames graduated according to specified draughts of water. The Engineers (Messrs. J. Quick and Son) report that the plant is in good working order.

The 39th annual meeting of the Wrexham Water Company was held last Tuesday under the presidency of Mr. W. J. Sisson, the Chairman of the Directors. The report set forth that the expenditure on capital, amounting to nearly £4000, had been chiefly incurred in completing new works. During the year, wa'er had been laid on to 146 houses; making a total of 5422 houses now supplied. The Directors recommended the payment of the full preference dividends, and dividends at the rate of 6½ per cent. per annum upon the consolidated stock, and of £4 11s. per cent. per annum upon the ordinary shares. The report and the recommendation as to the dividends were unanimously adopted. The meeting was then declared special for the purpose of authorizing the Directors to raise additional capital. The Chairman explained that the Company were in debt to the extent of about £4000; but, considering the extensive works they had had in hand, this was not a large sum. They desired power to raise £10,000; but they would, he thought, only call up about £5000. The power asked for was unanimously granted.

The half-yearly meeting of the Yeadon Water Company was held last Wednesday—Mr. Joseph Peel (Chairman) presiding. The Directors in their report recommended dividends at the rate £5 15s. per cent. per annum on the original capital (1870), and of £4 0s. 6d. per cent. per annum on the "B" stock (1889), and the carrying forward of a balance of £229. In moving the adoption of the report and the payment of the dividends recommended, the Chairman said the income for the past half year was £240 less than for the previous similar period; but this was due to the fact that the Horsforth Company had purchased less water by this amount than they did in the preceding six months. The reservoir was fuller now than it was at this time last year, and contained about 80 million gallons. Mr. W. Coupland seconded the motion, which was carried unanimously. In reply to questions, the Chairman said there had been complaints as to the action of the water on lead; and the Directors had determined to replace all lead pipes belonging to the Company by iron ones. They would recommend property-owners to do the same.

FATAL CASE OF GAS POISONING AT PLYMOUTH.

Alleged Defective Workmanship.

Another fatal case of gas poisoning has occurred at Plymouth. On the night of Thursday, the 10th inst., a child named Henry Adye Buchan, aged two-and-a-half years, the son of Mrs. Buchan, the widow of a Surgeon lately practising in the town, was found unconscious in his bedroom, and died from what medical evidence showed to be poisoning by gas. The inquest was opened on the following day before Mr. J. Graves, the Deputy-Coroner. Mr. Eric Ward, Solicitor, appeared for the relatives of the deceased; Mr. T. H. Geake, Solicitor, for the Plymouth and Stonehouse Gas Company.

Lena Richards, domestic servant, said that Mrs. Buchan had been away from home for a few days, acting as Superintendent of a local Convalescent Home in the absence of the Matron of the Institution. She put the child to bed at 7.30 p.m. on the Thursday evening. The room was the largest in the house; and both the door and window were left open. At 9.15 she went to the room, and found him lying over the rail of his cot, as though in the act of climbing into the adjoining bed. When she lifted him, she found he was insensible; and a doctor was sent for. She did not notice a smell of gas in the room. On the Wednesday, when she went to light the gas-stove, she found there was no gas, although the meter tap was turned on. A smell of gas in the house had been discovered by Mrs. Buchan on the Monday. In consequence of being unable to light the stove, she communicated on Wednesday with the Gas Company, and also with the owners of the house, and a plumber and a man from the Company came and attended to the meter, and the supply of gas was restored. On the Thursday she again saw the plumber about a smell of gas in the bedroom. He found that the tap of the incandescent light was on, and he also went into the drawing-room and a back room, and made similar discoveries there.

Dr. Woollcombe gave evidence as to the efforts of himself and Dr. Turner to restore the child. Artificial respiration was resorted to, and in about forty minutes there was a slight restoration of animation. At the end of an hour the child was breathing naturally, although still unconscious, and he remained in this condition for some time. He then developed symptoms of a clot of blood on the brain, and at 3.30 a.m. on Friday he died. The post-mortem examination showed that death was due to asphyxia caused by gas poisoning followed by thrombosis (clot) of one of the vessels in the brain. The witness added that when he entered the house on the Thursday evening he perceived a strong smell of gas; and there was also a powerful odour when he entered the child's bedroom at two o'clock on the following morning, although the meter had been turned off two or three hours.

In answer to Mr. Ward, witness said he understood that the door of the bedroom was closed when the child was put to bed. Assuming that both the door and the window were open, he should not have expected suffocation by gas to take place in so short a space of time. He did not know sufficient of the nature of the gas to express an opinion as to the effect it might have under the circumstances.

Thomas Winsor, plumber, said he went to the house on Friday to examine the gas-fittings. He turned the gas on at the meter, and within three minutes the smell of gas was so bad in the room occupied by the child that one could not stop there. He examined the pipes underneath the floor, and did not find any leak; but in the pipe under the floor of the adjoining room there was a fracture from which sufficient gas was escaping to supply three lights. This pipe, which was of lead, was the supply-pipe to a pendant in the room below; and, in his opinion, it was very improperly fixed. It ought to have been lifted and permanently supported.

The Jury went to look at the pipe; and on returning the Foreman remarked that, as a practical man, he considered the pipe very badly fixed. It should have been supported by a couple of blocks.

Percy Hicks Lean said he was a plumber in the employ of Messrs. S. Hawken and Son, who were contractors for part of the work in the erection of the terrace of new houses in which Mrs. Buchan resides. He and another man la'd iron pipes through the house, leaving the connection holes open. The lead pipe in which the fracture occurred was not in his work. On Wednesday afternoon he was called to the house about the gas, and found the meter at fault, and this was corrected. He was called in again on Thursday, and perceived a strong smell of gas, which he attributed to escapes from the taps being turned on. In the front room, the taps were on full; and he struck a match and lit the gas.

The inquiry was adjourned for further evidence, including that of the man who laid the pipe in which the fracture was discovered.

ELECTRIC LIGHTING NOTES.

At the last quarterly meeting of the Harrogate Corporation, it was resolved to apply to the Local Government Board for sanction to borrow £28,000 for extending the electric light station and mains, and for the purchase of new plant.

At the meeting of the Wakefield City Council last Tuesday, it was decided, on the recommendation of the Electric Light Committee, to apply to the Local Government Board for sanction to the borrowing of a further sum of £25,000 for extending the electric light works.

After considering the matter for eight months, the Town Council of Penzance came to the conclusion last Wednesday that it is their duty to apply for a Provisional Order for lighting the town with electricity. The resolution expressed the opinion that the business could be undertaken with "a reasonable prospect of success." As a matter of fact, the prospect is admittedly a little remote. A supplementary report was presented by the Borough Surveyor (Mr. F. Latham) on the financial aspects of the scheme. In framing his estimate, Mr. Latham took as a guide Altrincham, Bexhill, Harrogate, Morley, Nelson, Taunton, Whitehaven, Stafford, and Canterbury—the towns nearest in size to Penzance now supplied with the electric light. Judging by their experience and his own knowledge of Penzance, he arrives at the conclusion that there will be a loss of £2000 on the working of the undertaking in the first year, and that there will be a gradually diminishing loss until the fourth year, by which time the adverse balance will be £4150. In order to provide for

this, he suggests that it should be included in the amount to be borrowed, so that the loss at the commencement may be spread over twenty years. In eight years, Mr. Latham anticipates that the undertaking will yield a profit of £1000 per annum. All the calculations are based upon the sale of electrical energy at 6d. per unit.

At the Municipal Offices, Colchester, last Wednesday, Mr. E. Sandford Fawcett held an inquiry, on behalf of the Local Government Board, with reference to an application of the Corporation for permission to borrow £6500 for the purposes of electric lighting. The Borough Accountant, in supplying the usual statistics required by the Inspector, stated that the area of the district was 11,324 acres, the population in 1891 being 34,559; but as it had increased at the rate of 1000 each year during the last decade, the total was now about 42,000. The annual assessable value was £131,032; and the total amount of the outstanding loans reached £168,590. Mr. Barritt, the Chairman of the Electric Light Committee, said the loan now asked for was the second for electric lighting purposes; the first having been sanctioned in February, 1897, for £14,900. The purpose of the first loan was to acquire land to erect buildings, obtain certain plant, put down mains, and supply current in a certain limited area. This portion of the work had been completed; being carried rather beyond the compulsory area, which was a very limited one. The second loan was for additional plant, for the extension of mains, and for an amount expended on the capital account beyond the loan first sanctioned. Questioned by the Inspector as to why the Council needed to extend their mains, Mr. Barritt replied it was to meet the demand. They had definite applications for 811 lights, which would be provided as the applicants were connected; and this would raise the number of lamps they were supplying to 45,202. The Inspector desired to know whether Mr. Barritt purposed entering into the financial aspect, and dealing with the expenditure incurred and the revenue received. He replied that it was impossible, in the first year of working, to say what the expenditure was. On the 25th of March there had been sold 15,325 units, for which £429 14s. 10d. was received. So far as was estimated, the working expenses amounted to £260 8s. 3d., to which, however, had to be added interest and redemption, which amounted to £852 every year. By an arrangement, the contractors were paying interest on the sinking fund for two years; and they were under an agreement to work the station for this period—sharing any profit with the Council. If there was any loss, the contractors would bear it. In these circumstances, there would be no loss to the ratepayers during the first two years of working. Speaking of the £1714 excess of expenditure incurred on the first loan, Mr. Barritt said it mainly arose through under-estimates being made; the largest item being in respect of the building of the lighting station—the extra amount coming to £435. Mr. W. C. Shaw, the Hon. Secretary of the Ratepayers' Association, opposed the application on the ground of the incompetency of the Council to trade. He contended that there must have been something wrong in the estimates if the excess referred to was unavoidable. He complained that at the previous inquiry the Town Clerk said the works would be in the hands of the Local Authority; but they were now aware that a Company were carrying them on for two years. A guarantee was also given that the works would be started within six months of receiving the Order; but they found that nearly two years had elapsed before the station was opened, and then not till after lavish expenditure. Through one customer—the Military Authorities—they had incurred a loss of £573; and this was a serious matter for the ratepayers, who had to bear the loss, which he suggested the Council were endeavouring to make up by including it in the £1714 excess. He did not desire the Council to have more money for electric lighting purposes if they intended spending it in the way they had been doing. The members of the Association did not believe in the Council taking on trading with the electric light. Captain Caitham also opposed the application, on the ground that he objected to municipal trading. Mr. H. Bull, another ratepayer, opposed the application because the borough was already overburdened and embarrassed with loans. The inquiry then closed.

HARROGATE WATER-WORKS ARBITRATION.

In the "JOURNAL" for June 6, p. 1502, we reported the proceedings in an arbitration held at the Westminster Palace Hotel, London, before Mr. J. W. Fair, of Haigh Hall, Wigan, to fix the price to be paid by the Corporation of Harrogate to Sir Henry D. Ingilby, Bart., in respect of the purchase of a portion of his Haverah Park Estate, near Harrogate, together with certain rights as to easements, &c., needed in connection with the extension of the water supply of the town. The award has since been taken up—amounting to £14,398.

At the last quarterly meeting of the Town Council, Alderman Fortune, the Chairman of the Water Committee, said that statements had been made that it was very unwise for the Corporation to go to arbitration with respect to land required for the new water-works, and that it would have been better if they could have arranged the matter privately. But those who made the statement hardly knew the circumstances. The Arbitrator had fixed the award at £14,398; and if they took the Clerk's estimate of the cost of the arbitration at £4500, they would have a total of £18,898. The claim made by Sir Henry Ingilby in the first instance was £24,000; but when they went in for arbitration it was £27,993. When Sir H. Ingilby's agent met the Council, the latter tried to get a fixed rent-charge in connection with the Scargill reservoir, for land at £6 per acre, and road, pipes, &c., at 1d. per lineal yard. He (Sir H. Ingilby) demanded £342 12s. 10d. per year in perpetuity; Beaverdyke reservoir, £106 9s. 2d.; Ten Acre reservoir, £5 6s. 4d.; water rights for Scargill, £400—a total of £854 8s. 4d. perpetual yearly rental. The total cost of the award was £18,898, which, at 4 per cent. interest, and repayment in 50 years, meant a yearly payment of £755 18s. 4d., as against £854 8s. 4d.; or a yearly saving to the town of £99 9s. 11d., while at the end of 50 years the land, easements, &c., would become the property of the town. In addition to the above charges, Sir H. Ingilby's agent wanted temporary charges as follows: 1s. per yard for stone—10,000 yards, £500; 1s. per yard for clay—20,000 yards, £1000; temporary use of 12 acres of land for four years, at £2 per acre, £96; disturbance of game, £200; probable costs (a low figure), £204—or a total of £2000. He thought they had done far better by arbitration, though not so well as he expected, than by a private arrangement with Sir H. Ingilby and his agents.

THE DRY WEATHER AND THE WATER SUPPLY.

The long continuance of dry weather which has been the special feature of the present summer has necessarily given rise to some anxiety in certain quarters as to the maintenance of the water supply. Reference was recently made in the "JOURNAL" to the position of affairs in Birmingham and Manchester, where it had been found necessary to caution the consumers against extravagance in the use of water; and in other places there has been enforced curtailment of the supply in consequence of the drought.

Commencing with the Metropolis, it is satisfactory to find that all the Water Companies are in a position to keep up a full supply of water. The East London Company are relieved from much anxiety by the passing of the Intercommunication Act of last session, the value of which measure, it is gratifying to notice, is being acknowledged by the Press. All the Companies' officials, however, consider that a great deal of the water they send out is wasted through recklessness or carelessness; and the East London Company, in particular, are keeping a very watchful look-out for delinquents in this respect. They have not only issued notices against waste, but have already detected some 120 cases in which water has been wilfully wasted. The Lambeth Company have been compelled to take proceedings in one or two instances; and others are under consideration. Their inspectors have been specially instructed to report all cases of waste. All over London the extent of the mischief produced in this way is very great.

Some interesting figures relating to the water supply of the city were laid before the Water Committee of the Manchester Corporation at their meeting last Thursday, over which Alderman Sir John Harwood presided. A record consumption was established on the 3rd inst., the amount of water which was used on that day being 41 million gallons. This figure has not since been passed; but the daily consumption still remains very high. On Wednesday it was 39½ million gallons. Until recently the quantity of water in stock was computed on an estimated diurnal consumption of 32 million gallons; but in consequence of the great increase which has taken place this summer, that average has been raised to 35 million gallons. On this basis, the stock of water now in hand is equal to 71 days' supply. A fortnight ago, the stock, calculated on the lower standard, was equal to 94 days' supply. Thirlmere Lake is now 3 ft. 1 in. below the level of the overflow sill. This diminished depth has never been reached before by actual consumption; but on several occasions, when repairs were in progress, the surface of the lake was 6 feet below the sill.

At the meeting of the Bradford City Council last Tuesday, the minutes presented by the Water Committee contained the announcement that the water supply was to be shut off between the hours of 7 p.m. and 6 a.m. as from the 14th inst. The Chairman of the Water Committee (Alderman Holdsworth) said, with regard to this matter, that he was disappointed in some respects and pleased in others. He was pleased because the consumption of water for trade purposes was so large that it said much for the wellbeing of the industries of the city; but, on the other hand, he was sorry the total consumption had increased so much. On the previous Friday, the consumption in Bradford was 15 million gallons; and during the week 90 million gallons were used. The large increase had taken the Committee by surprise, and had exhausted their supplies much sooner than was expected. Notwithstanding the fact that they were sending out 3 million gallons a day from the new Nidd works, the Committee had been brought to the present difficulty by the protection they were trying to get for the high-level system. He was almost afraid that, in trying to avoid a shortened supply, they were running a little nearer on the high-level than they ought to do. However, with economy generally, and especially in street and garden watering, the probability was that they would be able to get over the difficulty without anybody seriously suffering. The quantity stored at the low and intermediate levels was 250,899,000 gallons less, and on the high level 134,295,000 gallons less than at the last Council meeting. The Committee had been brought into their present position because they could get only 6½ million gallons a day by the old works into Bradford, though they had several times put 7½ million gallons through under pressure. In addition they had been getting 3 million gallons a day from the new source of supply, which brought the total up to very nearly 10 million gallons per day. As, however, the consumption had averaged nearly 13 million gallons for every day in the previous week, and 12 million gallons per day for many weeks past, a deficiency had arisen, and the Committee had had to draw the reservoirs so low that they were not able to pump for any considerable length of time. They had therefore to face the difficulty of short supply. He hoped that within a very little time—probably a fortnight—they would be able to bring 7 million gallons a day from the new mains; but this could not be got beyond an elevation of 838 feet. Alderman Holdsworth presented a tabular statement showing that the total storage on the 14th inst. amounted to 925,846,000 gallons, compared with 1,211,468,000 gallons on the corresponding day last year—a deficiency of 285,622,000 gallons. At a meeting of the Cleckheaton District Council on the same day, complaint was made of the action of the Bradford Corporation in curtailing the supply. It was decided to inform the Corporation that the agreement between the two Authorities was for a constant service; and that, in case of failure to give it, negotiations would be opened with the Morley Corporation for a supply of water from their mains, which pass through Cleckheaton.

The Lancaster Corporation recently made special appeals to the townspeople to use the water with economy, owing to the prevailing drought. The yield from their watershed in Wyresdale is less than it has been for many years; while they are under contract to supply, in addition to Lancaster, the towns of Morecambe and Heysham, and several adjacent villages. At the present time they are making a reservoir at a cost of £65,000, at Blea Tarn, which, it is thought, will enable them to store sufficient water to meet all emergencies. The pressure is so low that the Morecambe people are complaining; while in Lancaster the inhabitants have not been able to get sufficient water for domestic use. The water is, until further notice, to be turned off from 9 p.m. until 6 a.m.

At the meeting of the Ashton, Stalybridge, and Dukinfield Joint Water-Works Committee last Thursday, it was reported that the reservoirs contained 230,390,000 gallons less water than at this time last

year. There is only sufficient for 10½ weeks' supply. The Committee have not yet resorted to any curtailment; and the Chairman made an earnest appeal to all consumers to exercise the greatest care in the use of water for all purposes.

The question of the Wigton water supply is becoming serious. A few days ago, Mr. G. Fell, the Urban District Council's Surveyor, discovered that there was only 7 inches of water in the reservoir; and this startling position of affairs has necessitated the water being turned off for a longer period at night and in the early mornings than has been usual lately. At their last meeting, the Council discussed a proposal to provide another reservoir, in which water when plentiful could be stored for times of emergency, instead of being in the early and latter portions of the year discharged into the river by the overflow-pipes. Now that the town is threatened with a water famine, the inhabitants are more than ever convinced that some remedial measures should be taken, with a view to preventing a recurrence of the present state of things.

A scarcity of water, which is causing grave anxiety to the Local Authorities, prevails in East Kent, especially in the hilly districts. Such a dearth of water has never been known before, and it is so serious that the unprecedented step has been taken of strictly prohibiting the supplies to public-houses in the villages being used for any other than purely domestic purposes. In some villages all the springs have failed, and water has been carried a distance of from three to four miles. At Challock, as much as 6d. is charged for water for travellers' horses passing through the village.

A word of warning has been issued to consumers of water in Clevedon. It is pointed out that for some time past the consumption has amounted to more than 50 gallons per head every day of the week, and the supply has only been maintained by pumping continually day and night. The Water Company have to provide for all possible contingencies, and are bound to keep in the reservoirs a sufficient quantity of water in case of fire. To do this, if the dry weather continues, it will be necessary to shut off the water a certain number of hours every day, or at least stop the road watering. Such a step ought not to be necessary; for the above-named quantity of water per head cannot be fairly used.

The prolonged dry weather is becoming a very serious matter to the inhabitants of the Rhondda Valley, as the brooks on the hillsides, the river, and the Council's reservoir have practically dried up. The storage capacity of the reservoir is only about 8 million gallons; while it is estimated that the supply per head of the population should be about 20 gallons. The Council's district is served by the Pontypridd Water-Works Company and the Council's own works; the former supplying the lower, and the latter the upper portion of the Rhondda Valley. The Council issued notices on Monday last week calling the attention of the consumers to the serious effect of the continued drought, and requesting them not to waste any water and to report at once any leakages. Notice was also given that proceedings would be taken against persons wasting or misusing water. It is satisfactory to find, however, that the portion of the district served by the Water Company is much better off for water than it has been during any previous summer like the present. This is due to the new reservoir built by the Company adjacent to the old one above Maerdy, and completed some months ago, although the opening was unattended by any formal ceremony. It was constructed at a cost of about £80,000, and has a capacity of 200 million gallons, against 20 million gallons in the case of the old one. At present this reservoir is nearly half full, and the other is nearly full; so that, even if no rain should fall during the next three or four weeks, there is every reason to believe that the district will have a fairly good supply of water. The district between Maerdy and Porth receives an uninterrupted supply daily, and so does the town of Pontypridd.

At Carmarthen the greater part of the town is supplied with water pumped from deep wells into reservoirs; the high part being served from springs. The Borough Surveyor and Water Engineer (Mr. F. J. Finglah) states that, so far, no very great inconvenience has been experienced in those parts of the town which are supplied from the reservoirs; but it has been necessary, since the commencement of the present month, to limit the time of supply to the hours between 10 a.m. and 6 p.m. In that interval, however, the water is always obtainable. Should the drought continue much longer, it will be necessary to further restrict the time to the fore part of the day only. The portion of the town supplied from the springs has suffered much more from scarcity of water than the other; and for upwards of two months it has not been possible to turn on the water for more than two hours a day.

According to the "South Wales Daily News," the condition of the water supply at Haverfordwest is about as bad as it can be. The supply depends upon pumping machinery; and the source is a well within a few yards of the river. Although there is not enough water stored to last more than a day or two, there is no immediate danger of a water famine so long as the river holds out. But the supply has been lamentably deficient of late; and many householders have had to go short. The amount supposed to be required for the town is 100,000 gallons a day; but much less than half of this quantity is often the result of the day's pumping. It has been as low as 25,000 and 30,000 gallons. This source is supplemented by what is known as the Fountain reservoir; but this only yields a few thousand gallons daily. For other than dietetic purposes, there are another few thousand gallons laid on in separate pipes from the old Scarrow Scant supply; but there is no doubt that in many parts of the town the people are often driven to use water from this and other doubtful sources for dietetic purposes. The Council have had before them the question of providing a new water supply for years past, and have taken up and abandoned many schemes. Just now they are re-considering two of these—viz., the Little Newcastle and Plumbstone gravitation schemes.

In the area of the Mountain Ash District Council for the past two or three weeks the supply has been limited; the water being stopped every day after 8 p.m. Since the construction of the new Llanwonno reservoir a few years ago, the quantity of water contained in it has never been so low as it is now; and unless a copious fall of rain takes place shortly it will assume a very serious aspect. The last notice issued by the Council was on Wednesday, requesting all consumers to economize as much as possible, and avoid all unnecessary waste. They also notified that the supply would be shut off, except between the hours of 8 a.m. and 10 a.m. and between 4 p.m. and 6 p.m. A careful watch is kept by the officials of the Council to immediately remedy any leakages.

Owing to the colliery workings having tapped the springs, the question of providing the inhabitants of the Forest of Dean district with their drinking water supply has every summer caused more or less anxiety; though as the population is nowhere very dense, the situation has not hitherto been critical. This year the prolonged drought has made itself felt. At Cinderford, the increasing population has compelled the Authorities to take steps towards almost doubling the storage capacity of the works. In order to husband the present reserve, the water is entirely shut off at night, and special notices have been issued warning consumers against waste. At Woolaston, the water question has just come to a crisis; the Parish Council having, by a majority of one, rejected the scheme, the approximate cost of which was £1500. But it is insisted that the question will have to be dealt with at no distant date. The agitation for a water supply at Lydney goes forward; and there are strong complaints that the scheme which has been adopted is not persevered with, as the want of pure and sufficient water has for some years been severely felt.

The condition of affairs in the Merthyr and Dowlais district as to water supply was referred to on Wednesday at the meeting of the District Council. The steps which Mr. F. F. Harvey, the Surveyor, had taken in respect of the conservation as far as possible of the limited supply of water were reported upon. Notices had, it was stated, been issued warning the public of the scarcity of water. The Chairman (Mr. D. W. Jones) added that there was only about a three weeks' supply. The Surveyor said that if the public were careful they could go on for two or three weeks. If they were extravagant, naturally the water would not last so long. The matter had given him a great deal of anxiety. They had about 25 million gallons of water at Pentwyn, and about 15 millions in the other reservoir. There was a little water coming from the 5000 acres of gathering-ground, which would very nearly furnish the compensation water to the millowners. Therefore this gave them about three weeks' supply. The Merthyr Council have given notice to the Gelligaer and Rhigos Rural District Council that the supply of water was being cut off from 8 p.m. until 5 a.m.

It is now nearly three months since the commencement of the present dry weather; and therefore it will be of interest to ascertain what has been the frequency and volume of the rainfall during that period. This we are in a position to do from the following table, giving the number of times rain was measured, the total quantity, and the loss or gain:—

Locality.	Wet Days.	Rainfall. Inches.	Loss or Gain.	Locality.	Wet Days.	Rainfall. Inches.	Loss or Gain.
Leith	21	4·5	−1·9	Scilly	18	3·6	−2·3
Aberdeen	28	4·9	−1·8	Jersey	19	3·0	−3·1
Nairn	28	3·8	−2·5	Dungeness	15	2·2	−3·8
Wick	32	3·3	−2·8	Oxford	13	2·7	−3·7
Shetlands	31	3·5	−2·9	London	16	1·9	−4·2
Hebrides	34	5·6	−2·7	Yarmouth	17	3·6	−2·8
Roche's Point	22	5·2	−3·8	Spurn Head	24	2·4	−2·4
Valencia	37	5·9	−4·9	Shields	33	4·5	−1·7
Belmullet	33	5·5	−4·0	Loughboro'	18	3·0	−3·3
Malin Head	28	3·1	−5·3	Liverpool	28	5·4	−1·5
Donaghadee	28	4·9	−2·2	Holyhead	24	7·6	+1·3
Parsonstown	28	7·8	+0·1	Pembroke	17	4·0	−2·3

These figures show that the dry weather has affected practically the entire kingdom, for, with the exception of a normal quantity in Central Ireland and an excess of 1½ inches in North Wales, in every locality there has been a well-marked loss. Over the North of England and Scotland the figures show a loss of from 1½ to 3 inches; while the rest of the kingdom had a much larger deficiency. England, however, has been the greatest sufferer; for most of the places in the list have not had half their proper share—the worst of all being the Metropolis, whose aggregate total of under 2 inches is less than one-third the normal quantity for the period. To express it in a practical form, we have been favoured with only 190 tons of water per acre, whereas in an ordinary summer we get 610 tons in the same interval.

THE DERWENT VALLEY WATER SCHEME.

Summary of the New Act.

As mentioned in our "Parliamentary Intelligence" last week, the Consolidated Bill of the Derby, Leicester, and Sheffield Corporations to sanction the above-named scheme received the Royal Assent on the last day of the session. It is entitled: "An Act to authorize the construction of works for impounding and distributing the waters of the Rivers Derwent and Ashop and their tributaries, and to constitute a Joint Board representative of the Corporations of Derby, Leicester, Nottingham, and Sheffield, and of the County Council of Derbyshire, for the purposes of such construction, and to confer further powers in relation to the supply of water on the said Corporations and County Council, and for other purposes." The following is an epitome of the provisions of the Act.

The preamble sets forth that, with the object of obtaining further supplies of water to meet the growing demands of the inhabitants within their limits, the Corporations of Derby, Leicester, and Sheffield severally introduced into Parliament Bills to obtain those further supplies from the Rivers Derwent and Ashop and their tributaries. Each of the three Bills was opposed by the promoters of the other two Bills, and by the Corporation of Nottingham, which also was desirous of obtaining a supply of water from these sources. During the consideration of the three Bills by the Committee of the House of Commons to which they were referred, negotiations took place between the four Corporations which resulted in an agreement, with the approval of the Committee, to entrust the obtaining of further supplies of water, from the sources named and for the purposes mentioned, to a Joint Board, representative of the four Corporations and of the Derbyshire County Council. Estimates of the cost of the works mentioned in the agreement showed that there would be required for the purposes of the Joint Board, £5,500,000; for the Derby Corporation, £120,000; for the Leicester Corporation, £600,000; and for the Sheffield Corporation, £425,000.

It is then enacted that there shall be a Board, to be called the Derwent Valley Water Board, and to consist of four members of the Derby Town Council, three of the Leicester Council, three of the Sheffield Council, two of the Nottingham Council, and one of the Derbyshire County Council.

Members of the Joint Board will be elected by their respective Councils annually in November (or, in the case of the Derbyshire County Council's representative, in October); and if a member of the Board ceases to be a member of the authority he represents, he will *ipso facto* cease to be a member of the Board. The first meeting of the Board will be held at such time and place as shall be specified in a notice issued to each member by the Town Clerk of Derby; but if it is not called prior to Dec. 1, 1899, it is to be held when and where the Local Government Board shall appoint. Subsequent meetings will be held as the Board may determine. One of the earliest and most important duties of the Board will be to appoint a standing Arbitrator, elected or re-elected annually, to whom any matter in which the interests of the constituent Authorities are not identical may be referred. The Board are empowered to acquire such as they may need of the lands delineated on the deposited plans, other than those referred to in the special provisions in the Act relating to the Derby, Leicester, and Sheffield Corporations respectively. Part only of certain properties, instead of the whole, may be taken; or easements obtained instead of the lands themselves. The period for the compulsory purchase of lands by the Board under the Act will cease after seven years from the present time. There is a long section devoted to restrictions against the removal by the Board of houses tenanted "by persons belonging to the labouring class," unless other houses are built to replace them.

Part IV. of the Act, comprising sections 45 to 64 inclusive, is the most important practical part of the measure, as it gives the Board power to make and maintain certain works. In all, 56 separate works are specified, which may be summarized as follows: (1) Works shown on the Derby plans and sections.—The Ronksley, Howden, Derwent, and Ashopton reservoirs and subsidiary works, comprising tramways and road diversions, and lines of pipes feeding the reservoirs and conducting water from them to service tanks to be constructed at Crich and Bargate, in the parishes of Crich and Belper respectively. (2) Works shown on the Leicester plans and sections.—A storage reservoir, to be called the Hagglee reservoir, and subsidiary works, comprising intakes, road diversions, and railways, also aqueducts from the Derwent and Hagglee reservoirs, filters and settling-ponds at Bamford, lines of pipes terminating in service reservoirs to be constructed at Ambergate, and an aqueduct conveying the water thence as far as the village of Sawley, near Long Eaton, in Derbyshire. (3) Works shown on the Sheffield plans and sections.—The Bamford reservoir and subsidiary works, consisting of road diversions, an alteration in the level of the Sheffield and Glossop highway, and a new road skirting the easterly side of the Bamford reservoir.

All the foregoing works are named and described in the first section (No. 45) of Part IV. of the Act. The remaining sections of this part protect from interference or stoppage all springs below the Bamford reservoir; define the limits of deviation from the deposited plans and sections to which the Board may go; nominate Mr. G. J. Symons and Mr. E. M. Eaton as Referees in the ascertainment of rainfall on the drainage area for the purposes of compensation water; and direct that one-third of the outflow of each of the six reservoirs authorized by the Act shall be for ever discharged as compensation water into the bed of the River Derwent or Ashop, as the case may be, "in a regular, uniform, and continuous flow throughout the 24 hours of every day." This discharge of compensation water is to be accepted and taken as full compensation to the several owners, lessees, and occupiers of mills, works, and lands, and other persons interested in the waters of the Derwent and Ashop. The compensation water may be diminished, or cut off entirely from any one or more of the reservoirs, provided the full amount required is made up by an extra discharge from the other reservoirs; but in no case is the discharge from the Derwent reservoir for compensation purposes to fall below one million gallons a day. Failure to send down the compensation water will make the Board liable to a penalty of £25 per day during the continuance of the default, recoverable by either the Derbyshire or the Nottinghamshire County Council; and the Board will also be liable to make compensation in money to any millowner or other person interested who sustains loss, damage, or injury by reason of neglect.

With regard to the completion of the works, if the Ronksley and Howden reservoirs are not finished within ten years, and the Derwent reservoir not within fifteen years from the passing of the Act, then, on the expiration of these periods respectively, the powers of the Board for the making of these reservoirs will cease, except as to so much of the work as shall have been completed. No time limit is appointed for the completion of the other three reservoirs or the subsidiary works; but the Board are directed to construct "as soon as practicable," and as a first instalment, "works capable of affording a total supply of water of not less than 12 million gallons a day. Except as otherwise provided in the case of the Derbyshire and Nottinghamshire Local Authorities, no one of the four Corporations are to be entitled "as of right" to a further supply for a period of five years beyond the date of receiving their proportionate supply from the first instalment of works.

Part V. of the Act is devoted to "Protective Provisions in relation to Works of the Board;" and the next part deals with the apportionment of the water and the expenditure in procuring it. The four Corporations are to share in the water obtained by the Board in the following proportions: The Derby Corporation, 25 per cent.; Leicester Corporation, 35·72 per cent.; Nottingham Corporation, 14·28 per cent.; and the Sheffield Corporation, 25 per cent. The Local Authorities of Derbyshire, however—except those of that portion of the Rother Valley situated in Derbyshire—are to be entitled to such supplies as they may require, not exceeding 5 million gallons a day; and the Local Authorities of Nottinghamshire are to be entitled, until 1930, to as much water as they may require, not exceeding 1 million gallons a day. Each of the four Corporations may deal with their own share of the water as they are empowered or authorized to deal with their existing supplies, subject, however, to a very important restriction. In ordinary circumstances, each of the Corporations may sell any surplus water to any authority, company, or person within their area; but the Act provides that such surplus shall not be so dealt with by any one of the four Corporations until it has been offered at cost price to the Board, who shall offer it at cost price to the other three Corporations simultaneously. In other words, the four Corporations have each a right of pre-emption in regard to surpluses possessed by any of the others. If there is competition for a surplus, the competing Corporations are to divide the surplus in the ratio of their statutory proportions of the whole supply. The expenditure of the Board on lands and works, including the annual payments in respect of interest and sinking fund, also the expenditure with respect to supplies to the Local Authorities of Derbyshire (other than the Derby Corporation and Authorities situated in the Derbyshire portion of the Rother Valley), and to the Local Authorities of Nottinghamshire, is to be by the four Corporations in the ratio of their statutory proportions. All revenue accruing to the Board is to belong to the four Corporations in the like proportions.

Part VII. of the Act refers to the creation of water districts in Derbyshire. Briefly, this provides that any district may apply to the Derbyshire County Council for the creation of a Water Committee for that district, properly constituted as a body corporate, whose business it shall be to take over a supply of water in bulk from the works of the Board, and distribute it in the district under their charge. But the County Council will not grant such application unless the local authority having jurisdiction within such district has failed to furnish it with a sufficient supply of pure and wholesome water.

The financial provisions of the Act are contained in Part IX.

The Board, as set forth in the preamble, are authorized to borrow sums not exceeding £5,500,000 for lands and works; but they may borrow other money to meet the interest due on loans for lands and works, until the expiration of ten years from the passing of the Act, by which time the Board may reasonably be expected to be in receipt of a revenue. No repayments of principal or payments into a sinking fund need be made before 1910. All moneys borrowed are to be repaid within 60 years from the date or dates of borrowing the same; but it is provided that, as to all moneys borrowed within ten years from the passing of the Act, the period within which repayment shall be made shall be 60 years from March 25, 1909. The Board may exercise their borrowing powers by creating and issuing stock. The money required by the Board for all expenditure other than for capital expenditure will be obtained from the four Corporations by precept upon them in proportion to their statutory obligations and liabilities; and such moneys will be paid by them out of their water revenues, district funds, and general district rates.

In Part X., which closes the general portion of the Act, there are a few miscellaneous provisions. The Board are enabled to contract to supply water in bulk, provided their doing so does not interfere with the rights of the four Corporations or of other persons and Local Authorities entitled to a supply under the Act.

The three remaining parts of the Act—Parts XI., XII., and XIII.—contain special provisions relating to the Derby, Leicester, and Sheffield Corporations respectively. The Derby Corporation are empowered to construct lines of pipes connecting the Board's aqueducts with a high-level service-tank to be constructed at Little Eaton, near Derby. The Leicester Corporation are authorized to construct aqueducts from the extremity of the Board's system at Sawley, in Derbyshire, to a high-level reservoir at Hall Gates, near Leicester; also to construct this reservoir and lines of pipes and other service reservoirs at Stoughton and Evington. The Leicester aqueduct will have to cross the River Trent. It is to be carried over on a bridge having two openings of not less than 120 feet span each, the southern opening to be so arranged for the protection of the Trent Navigation Company, that there shall be 100 feet clear width of water of a depth of 5 feet at low summer level; and the bottom of the bridge is to be at least 20 feet above the low summer water-level. The special powers of the Sheffield Corporation authorize them to construct "an aqueduct, conduit, or line of pipes and tunnel commencing in the Derwent reservoir, at or near the dam or embankment thereof, and terminating by a junction with the existing pipes of the Corporation immediately to the east of the embankment of the Rivelin lower reservoir." Then the terms of Sheffield's partnership with Rotherham are set forth. Rotherham is to have one-sixth of the water obtained by the Sheffield Corporation from the Joint Board, to pay one-sixth of the amount of the Board's precepts upon the Sheffield Corporation, and also to receive one-sixth of Sheffield's share of the profits of the Board's undertaking, if any. For any temporary supplies of water sold to them by the Sheffield Corporation, the Rotherham Corporation are to pay at the rate of 7½d. per 1000 gallons. The Water Authorities in so much of the Rother Valley as is situated within Derbyshire are to be supplied by the Sheffield Corporation, and are to pay at the rate of 7½d. per 1000 gallons, together with interest at 4 per cent. on the capital expenditure to which the Sheffield Corporation may be put in providing mains and pipes for such supply. These Authorities may not demand in respect of the district of the Chesterfield Gas and Water Board more than 20 gallons per day per head of the population to be supplied, nor in respect of the district of the Chesterfield Rural District Council more than 12½ gallons per day per head of the population, within the district of the Council.

THE RESULTS OF THE WATER-METER SYSTEM AT RICHMOND (VA.).

The subject of the supply of water by meter, as carried out at Richmond (Va.), was dealt with by Mr. Charles E. Bolling at the recent meeting of the American Water-Works Association. The author is Superintendent of the Water Department of the city; and his paper, a full abstract of which was given in a recent number of the "Engineering Record," contained some instructive particulars. He introduced it with a brief explanation of the local conditions. Richmond was one of the cities to early construct water-works at municipal cost. In 1830, the first pumps and reservoir were provided, and were designed to supply a population of 16,000 people. The plan adopted was to pump water by water power into a reservoir high enough to furnish a supply by gravitation. Richmond, like ancient Rome, is built upon seven hills, divided by deep ravines. The part first built up and supplied with water was on the lower hills and valleys; and the city, as it grew, spread out on the higher plains and hills. In the beginning, there being no sewers, a single hydrant sufficed, and often served to furnish water to several adjacent premises, even as in former days a number of the citizens had procured their water from one spring or well in the neighbourhood. From time to time, as occasion required, pumps and mains were added; then, after sewers were made, the demand arose for greater conveniences and luxuries at higher points and on the upper floors of houses, until

finally a larger reservoir on a more elevated site was requisite. When this was completed, the result was greater pressure and increased waste. Mr. Bolling took charge of the works in 1885, and his greeting was an urgent demand for more water. At the time the pumping and delivering capacity was 24 million gallons a day to a population of 70,000.

After carefully studying the distributing system, he divided it into three districts or services—high, low, and intermediate. The low-lying district was furnished from the old reservoir; one main from the new reservoir supplied the middle district; and another the high district. Relief was quickly given to the last; but the intermediate district, which took nearly three-fifths of the whole consumption, was not benefited to any extent, on account of the considerable variation in elevation, differing as much as 180 feet, and the great waste from the fittings at the low points—the plumbing in these localities being the oldest and the worst. The daily consumption per head in 1870 was 45 gallons; in 1880, after the new reservoir was built, it was 92 gallons; and in 1890, 168 gallons. Residents on the high points had no water on the second floors during the day; and the risk from fire for want of pressure was serious. The question presented was mains or meters. Additional mains carried with them extra pumps. The estimated cost was $270,000. Finally, after years of pleading, in the spring of 1897, the City Council granted $15,000 for the purchase of meters; and Mr. Bolling was empowered to place them where he deemed best. He commenced fitting them in June of that year, and placed them, irrespective of the size or condition of the premises, on the lowest level. Nearly all the taps in this section supplied small dwelling-houses having two fittings—a hydrant and a closet. The average consumption at each tap per month was nearly 30,000 gallons; and in a few instances it reached as high as 140,000 gallons. This great waste was at once checked by the meter, or rather the bill; and at the end of the year, the pressure at the high points had increased 40 per cent. Another grant of $5000 for meters was made in 1898; and they were set in the low districts. At the end of the year the pressure had increased 100 per cent. in the high districts. All complaint of want of water had ceased; and the pressure at these points was the same as would have been obtained by expending $270,000, and assuming an annual expense of $17,000.

Prior to placing the meters, the water-power pumps were insufficient to keep up the supply; and it was often necessary to run the steam-pump, which increased the cost of pumping $2500 per annum. This pump has not been used for the past eighteen months. It will be seen, therefore, that the saving per annum amounts to $19,500—nearly equal to the entire outlay for meters. The consumption per head for 1898 was 99 gallons per day—a reduction of 41 per cent. from that of 1890; and the quantity of water used now is 27 per cent. less than in 1890, while the population has increased 20 per cent. In the past, during frosty weather, it was the general custom to leave the water running and wasting, to prevent frozen pipes. The result was little or no pressure, and reservoirs rapidly emptying, in the face of the fact that all the pumps were worked to their full capacity. A short time ago, Richmond experienced the severest weather known in the vicinity. During that period a fairly good pressure was maintained in the city, even at the high points; and the water-power pumps were abundantly capable of preserving the supply and keeping the reservoir full.

PLYMOUTH CORPORATION WATER SUPPLY.

The Remuneration of the Engineer.

At the Meeting of the Plymouth Town Council last Tuesday, another long debate took place on the question of the remuneration of Mr. E. Sandeman, the Water Engineer, for his services in connection with the construction of the Burrator reservoir. In the first place, a resolution was proposed for the adoption of the report of the Special Committee, who were directed to consider and report upon the terms of Mr. Sandeman's appointment, and the circumstances under which the engineering work in connection with the reservoir was entered into. The Committee, after reviewing all the circumstances from the time of Mr. Sandeman's appointment in July, 1891, arrived at the conclusion that he had no reason to suppose his salary was intended to recompense him for his services in connection with the Burrator works. On the contrary, he was led to believe that he would receive extra remuneration for such services. The Committee could not agree as to whether or not the Council intended an increase of salary of £50 per annum, made in December, 1897, to cover this extra remuneration; but they found it abundantly clear that neither Mr. Sandeman nor the Chairman of the Water Committee so understood it. When the resolution was submitted, it was decided that it should be for "receiving" the report only; and, as an amendment to this, it was proposed that the report be referred to the Water Committee for further consideration. The amendment having been negatived, and the report received, a further resolution was proposed to pay Mr. Sandeman £685; making, with a previous payment of 300 guineas, a total of £1000 for his services in connection with the reservoir. An amendment was moved to the effect that there was nothing in the report of the Special Committee to warrant the conclusion that Mr. Sandeman was entitled to further remuneration, and expressing the opinion that by "the amount he has already received"—300 guineas for the laying of the pipe-line and 100 guineas for pricing the quantities for the reservoir work—together with the increase of £50 in his salary, "he has been amply remunerated for extra services, if any, so rendered." Alderman J. Shelly, who led the opposition to the original proposal to pay Mr. Sandeman 700 guineas, expressed his dissatisfaction with both the motion and the amendment. He was still of opinion that the Council were not committed to pay the Water Engineer anything; and it was a matter of extreme danger and peril that the Council should be bound, or said to be bound, by chairmen or members of committees, to anything to which they had not assented. Still he thought Mr. Sandeman was entitled to something more than he had had already; and, as a matter of justice, if neither the resolution nor the amendment was carried, he would propose the payment of 300 guineas in settlement. The amendment was, however, carried by 21 votes to 19; so that apparently the question is now finally settled, but adversely to Mr. Sandeman.

Bishop Auckland Water Supply.—Owing to exacting demands made upon them from time to time by the Durham County Council, the Bishop Auckland District Council, at a cost of upwards of £2000, constructed a new filter-bed on their West Mill Estate, and this was publicly opened last Wednesday.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 479.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p. c.	21½—22½	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15½—16½	..	4 10 11
200,000	100	July 3	5	Australian 5 p. c. Deb.	102—104	..	4 16 2
200,000	5	May 12	6	Bombay, Ltd.	6¼—6⅜	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid	4¼—4⅜	..	5 1 1
880,000	Stk.	Aug. 16	12	Brentford Consolidated	272—277*	+3	4 6 8
270,000	,,	,,	9	Do. New	310—315*	−½	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145*	+2½	3 9 0
169,375	,,	June 15	4	Do. 4 p. c. Deb.	126—130	..	3 1 7
220,000	Stk.	Mar. 29	11½	Brighton & Hove Orig.	260—270	..	4 5 2
226,330	,,	,,	8½	Do. A. Ord. Stk.	194—197	..	4 6 4
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max.	125—130*	..	3 16 11
420,000	20	Mar. 29	10	British	44—46	−1	4 6 11
50,000	10	Feb. 24	12	Bromley, Ord. 10 p. c.	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c.	20—22	..	4 1 10
500,000	10	Apl. 27	6	Buenos Ayres (New) Ltd.	10—10½	..	5 14 3
220,000	Stk.	June 29	4	Do. 4 p. c. Deb.	100—102	..	3 18 5
150,000	20	July 13	8½	Cagliari, Ltd.	28—29	..	5 13 10
100,000	10	June 1	7½	Cape Town & Dis., Ltd.	13—14	..	5 7 2
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Apl. 13	13½	Commercial Old Stock	316—321	..	4 4 1
200,750	,,	,,	10½	Do. New do.	245—250	..	4 4 0
200,750	,,	June 15	4½	Do. 4½ p. c. Deb.	143—148	..	3 0 10
800,000	Stk.	June 15	10	Continental Union, Ltd.	185—190	−2	5 5 3
200,000	,,	,,	7	Do. 7 p. c. Pref.	182—187	..	3 14 10
51,600	Stk	Feb. 24	14	Croydon A 10 p. c.	—	—	—
168,400	,,	,,	11	Do. B 7 p. c.	—	—	—
855,000	Stk.	Aug. 16	5½	Crystal Palace Ord. 5 p. c.	133—138*	+⅝	3 16 1
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145*	+2½	3 9 0
486,090	10	July 28	11	European, Ltd.	22½—23½	..	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	16—17	..	4 17 1
14,993,075	Stk.	Aug. 16	4⅝	Gas-light and Coke	4 p. c. Ord.	107—109*	+1½	4 9 11
2,600,000	,,	,,	3½		3½ p. c. max.	95—98*	+½	3 11 5
3,799,785	,,	,,	4		4 p. c. Con. Pref.	124—126*	..	3 3 6
3,993,975	,,	June 15	3		3 p. c. Con. Deb.	99—101	..	2 19 5
70,000	10	May 31	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,800,000	Stk.	May 12	10	Imperial Continental	223—228	..	4 7 8
473,600	Stk.	Aug. 16	3½	Do. 3½ p. c. Deb. Red.	101—104*	+¾	3 7 4
75,000	5	June 15	6	Malta & Medn., Ltd.	5—5½	..	5 9 1
560,000	100	Apl. 4	5	Met. of	5 p. c. Deb.	112—114	..	4 7 9
250,000	100	,,	4½	Melbourne	4½ p. c. Deb.	110—112	..	4 0 4
541,930	20	May 31	5	Monte Video, Ltd.		12½—13½	..	7 8 1
617,946	Stk.	Feb. 24	9½	Newc'tle & Gatesh'd Con.		228—233	..	3 19 5
264,855	Stk.	June 29	3½	Do. 3½ p. c. Deb.		106—109	..	3 4 8
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	May 31	8	Oriental, Ltd.	7½—8	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—7	..	5 14 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—1¾	..	4 11 5
60,000	5	Mar. 29	7	Ottoman, Ltd.	5½—6	..	5 16 8
500,000	100	June 1	6	People's Gas of Chicago	2nd Mtg. Bonds	102—106	..	5 13 2
951,070	10	Apl. 27	7	River Plate Ord.	11½—12	..	5 16 8
250,000	Stk.	June 29	4	Do. 4 p. c. Deb.	100—102	..	3 18 5
250,000	10	Mar. 29	10	San Paulo, Ltd.	16—17	−½	5 17 8
195,000	Stk.	Mar. 29	10	Sheffield A.	244—249	..	4 0 4
209,053	,,	,,	10	Do. B.	244—249	..	4 0 4
447,427	,,	,,	10	Do. C.	244—249	..	4 0 4
5,600,000	Stk.	Aug. 16	5⅓	South Metrop., 4 p.c. Ord.	140—143	+½	3 14 7
1,520,000	,,	July 13	3	Do. 3 p. c. Deb.	101—103	..	2 18 3
120,000	Stk.	—	6	Tottenham and Edmonton	A. 5 p.c. B. 2½ p.c. 4 p.c. Deb.	143—145	..	4 2 9
250,520	,,	—	4½			103—105	..	4 5 9
55,100	,,	—	4			115—120	..	3 6 8
182,380	10	June 15	5	Tuscan, Ltd.	9—10	..	5 0 0
149,900	10	July 3	5	Do. 5 p. c. Deb. Red.	98—100	..	5 0 0
				WATER COMPANIES.			
746,184	Stk.	June 29	11	Chelsea, Ord.	313—318	..	3 9 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	167—170	..	2 18 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	148—153	..	2 18 10
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb.	155—160	..	2 16 3
1,720,560	Stk.	Apl. 18	7	East London, Ord.	210—215	−4	3 5 1
654,740	,,	June 29	4½	Do. 4½ p. c. Deb.	155—158	..	2 17 0
890,000	,,	,,	3	Do. 3 p. c. Deb.	101—103	..	2 18 3
700,000	50	June 15	7½	Grand Junction	10 p. c. max.	111—114	..	3 5 9
310,000	Stk.	Mar. 29	4		4 p. c. Deb.	135—140	..	2 17 2
708,000	Stk.	Aug. 16	14	Kent		358—363*	+3	3 17 2
160,000	,,	,,	7	Do. New, 7 p. c. max.		208—213*	+1½	3 5 9
1,043,800	100	June 29	10½	Lambeth, 10 p. c. max.		298—303	..	3 9 4
406,200	100	,,	8	Do. 7½ p. c. max.		225—230	..	3 9 7
850,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.		135—140	..	2 17 2
500,000	100	Aug. 16	12½	New River, New Shares		425—430*	+2	3 2 9
1,000,000	Stk.	July 28	4	Do. 4 p. c. Deb.		135—140	..	2 17 2
902,300	Stk.	June 15	7½	South-wark and Vauxhall	Ord.	200—205	..	3 13 2
126,500	100	,,	7½		7½ p. c. max.	193—198	..	3 15 9
489,200	Stk.	,,	5		5 p. c. Pref.	167—172	..	2 18 2
1,019,585	,,	Apl. 13	4		4 p. c. A Deb.	135—140	..	2 17 2
1,155,066	Stk.	June 15	10	West Middlesex		300—305	+2½	3 5 7
200,000	,,	,,	4½	Do.	4½ p. c. Deb.	154—158	..	2 17 0
200,000	,,	Mar. 10	8	Do.	8 p. c. Deb.	102—104	..	2 17 8
				* Ex. div.			

NOTES FROM SCOTLAND.

From Our Own Correspondent.

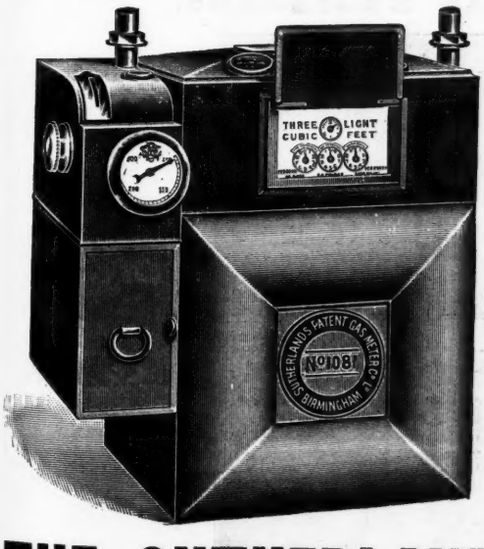
Saturday.

The Corporation of Glasgow do not dally over their business. The annual accounts of the Gas Department, a summary of which was published in the "JOURNAL" last week, were what I may call "rattled off" on Thursday in a few minutes. But then everyone has confidence in, and respect for, the other; and a definite policy being followed, so long as it is adhered to, the spirit of cavil, which is so rampant in some corporations, can scarcely find entrance. The statement of accounts was presented by Mr. R. M. Mitchell, the Convener of the Gas Committee, who said that the report was a very full one; and the Committee were pleased to be able to present it with a small balance at their credit. As members of the Corporation knew, the past year had been one of considerable difficulty in connection with the coal trade; and during the winter months, when the Committee were receiving very short supplies from their Contractors, they had found some difficulty in keeping sufficient stocks in the works for the necessities of the city, and special purchases were made at a considerable extra cost. The two factors which had resulted in a credit balance were: First, the price for residual products, which had risen during the year by an average of 6d. per ton, or something like £15,000 or £16,000 in all; and, secondly, the extraordinary output of gas from the various works, which had exceeded that of last year by 8½ per cent. Notwithstanding the use of electricity on a growing scale, it had been found, as in all large communities, that gas and electric lighting were not hurtful, but beneficial to each other; and he trusted that the Electricity Department and themselves would always continue to be on the same good terms. During the year they had increased the wages of their men by something like £10,000; and he hoped likewise that they would always be on good terms with them. Their new coal contracts, made during the last few months, were at a very much increased price over last year; representing something like £30,000. Notwithstanding this, the Gas Committee, possessing the faith which had always been theirs, proposed to continue the gas in the meantime at the present price of 2s. 2d. per 1000 cubic feet. They trusted that the price of residual products, which had risen still further by 10d. per ton, would assist them in keeping to the present price. With regard to the works, these had been maintained efficiently; and about 21 miles of new mains had been laid during the year. They expected to be able to meet satisfactorily any demand that might arise during the winter. With respect to parliamentary proceedings, the Council were aware that the Gas and Water Bill had been passed by Parliament and received the Royal sanction; and the construction of the new gas-works at Provan would be commenced as soon as possible. Mr. Foulis was engaged in completing the plans for the first section. As soon as these were completed, contracts would be given out; and the Committee hoped the Council would honour them by being present at the opening of the ground. These gas-works would be among the largest in the United Kingdom; and when the four sections were completed they would be capable of producing 40 million feet of gas daily, or considerably more than the whole present consumption of Glasgow. The Committee were therefore seeking to do all in their power to provide for the necessities of their successors. Bailie Fife, in seconding, said that for the fourth year in succession the price of gas remained at 2s. 2d. per 1000 cubic feet, although they had to pay £30,000 more for coal and £10,000 additional for wages to their workmen. He thought this a very satisfactory state of matters. The only jarring note in the business was introduced by Mr. D. M. Stevenson; and his complaint was a two-headed one. He thought that the balance-sheet should show what the value of the works was; and that it was hard upon large consumers of gas that £15,000 extra depreciation should be written off the Dalmarnock works—a sum which would be sufficient to write off the works *in toto* in five years. With this little grumble, the accounts were unanimously adopted. If Mr. Stevenson wishes to know the value of the works, it is to the valuation roll he must look; for the market value of the materials *in situ* is not the value of the works. The amount expended, less depreciation, is given in the capital account. As to the Dalmarnock works, it is surely a wise policy to write them down to the point at which, when they come to be closed, and are sold, there will be no loss upon them; and more especially when that can be done without disturbing other financial arrangements.

The Town Council of Dundee are in the throes of preparation for the reception of the Duke of Connaught, who is to perform some public ceremonies in the city next Saturday; but the distractions of an impending Royal visit are not sufficient to make them forget the reconstruction of the Corporation gas-works, which, at the present rate of progress, should be ready for use—part of them at least—by the year 1902. The Gas Committee are satisfied that the plans for the reconstruction are in an advanced state of preparation. Sections one to six have, it is said, received the approval of Mr. W. Foulis, the Consulting Engineer; and, in a report which has been issued, it is laconically added that "when he has approved of section seven, which has reference to the new retort-house, the tenders for that part of the work will be submitted to the Town Council." The writer of this report apparently considers that the submission of the plans to Mr. Foulis is merely a formal affair, and that all that gentleman has to do is to approve. Then it is added that it is expected the matter will come up at the September meeting of the Council; and if the necessary sanction is given, the new retort-house will be started immediately thereafter. The Gas Committee wish to get the shell of the retort-house put up before the winter sets in, so that the erection of the retort-bench can be proceeded with under cover, independent of the weather, which, I should be inclined to say, is not likely to be accomplished.

The annual accounts of the Greenock Gas Trust were submitted to the Police Board on Tuesday. It was stated that the income for the past year was £8102, and the expenditure £7736; leaving a surplus of £366. Mr. T. Mitchell, in submitting the statement, remarked that the past year had shown a very large increase in the consumption of gas—in fact, the largest which had ever been made in one year. The total revenue from meter consumers was £2446 in excess of the previous year. At the beginning of last year they anticipated in the estimate a surplus of £1040; but subsequent to that date the Board resolved to reduce the

SUTHERLAND'S
PATENT
PREPAYMENT GAS-METERS



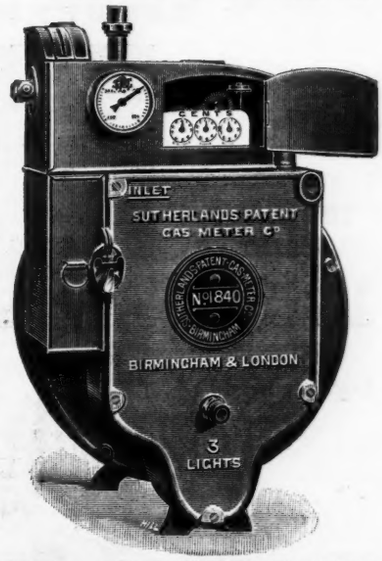
SPECIAL FEATURES:

Accuracy of Measurement.

Simplicity of Construction.

Excellency of Workmanship and Material.

EVERY METER GUARANTEED.



THE SUTHERLAND GAS-METER COMPANY
ESSEX WORKS, BIRMINGHAM.

price of gas by 1d. per 1000 cubic feet, and this had reduced the estimated balance by £966. During the year, the workmen had had their wages increased. These two items amounted to £1919; and, with the additional cost of coal that they had to purchase, they made a total of almost exactly the sum expended in excess of the estimate as there was of income. The only regrettable feature was that they were unable to still further reduce the price of gas. With regard to next year's estimate, they would have to provide for something like £1300 more for coal, which would bring out an estimated surplus of £1950. Bailie Cameron proposed as an amendment that the accounts be remitted back to the Gas Trust for further consideration. The voting being equal, the Chairman gave his casting vote in favour of adopting the minutes, which were accordingly passed.

The "North British Daily Mail" reports that on Wednesday night there was a meeting of the Glasgow Branch of the National Gas Workers' Union. Mr. George Galloway, who presided, said the object before them was the further organization of the society, especially of the electric lighting department of the Corporation. The workers in it were anxious to join. Progress had been made to the extent that two of the under gas managers had expressed willingness to recognize the officials of the Union. But Mr. Lynas, the District Secretary, stated that Mr. Foulis had been written to as to whether he would recognize the Union, but no answer had been received.

The Commissioners of the Burgh of Johnstone—which is the new title to be given to the Corporations of Police Burghs, instead of "Police Commissioners"—on Tuesday resolved to appoint Mr. J. M'Gilchrist, of Dumbarton, to report to them upon the subject of the extension of the plant in the gas-works. The Commissioners also unanimously resolved to reduce the hours of the gas workers to eight per day, and to give them their present wages.

As the outcome of the pother which was made in the Galashiels Town Council a few months ago over the street lighting, and which was initiated by a sort of complaint that the Gas Company were not doing the town justice, but which collapsed into an admission that the Town Council themselves were not burning sufficient gas, the Works Committee on Monday recommended that the lamps be adjusted so as to burn 3 instead of 2 cubic feet of gas per hour. The annual cost for gas at present is about £200, so that the proposed increase was practically £100 a year. Even this proved too much for the economists in the Council; and after discussion it was resolved that no more than £50 a year be expended in improving the lighting of the streets—only the more populous districts to be dealt with. Having accomplished this piece of cheeseparing, the Council proceeded to consider proposals, on a more lavish scale, for the introduction of electric lighting; but upon this subject they felt that they required more information, and it was resolved to employ an electrical engineer to report to them.

The Corporation of Glasgow had before them on Thursday the annual accounts of their Electricity Department. These showed the capital account to be £339,782; the total amount authorized being £700,000. There is a sinking fund of £11,537, and a reserve fund of £4192. The gross revenue for the past year amounted to £44,141, and the gross (or working) expenditure to £24,013, to which is added depreciation written off capital £8521; the balance carried to profit and loss account being £12,607, out of which the Committee had to meet interest on loans £7446, and sinking fund £3220; leaving a balance of £1941, which had been placed to the credit of reserve fund account. With reference to the prices to be charged for energy supplied either for lighting or for motive power purposes during the year which commenced on the 1st of June last, the Committee recommended that the same should remain as they were last year, except that to all consumers supplied at 250 volts the second or rebate rate be 1¼d. per unit instead of 2d. as heretofore. These prices were as follows: (1) Under the demand indicator system, 6d. per unit for the first 365 hours' use per annum of the maximum demand for supplies at all voltages, and thereafter 2¼d. per unit for 100 volt supplies, 2d. for 200 volt supplies, and 1½d. for 250 volt supplies. (2) Under the fixed charge system, 4s. 6d. per 8-candle power (32 watt) lamp fixed (or its equivalent, at £7 0s. 8d. per kilowatt) for 100 volt supplies, 4s. 4d. per 8-candle power lamp fixed (or £6 15s. 5d. per kilowatt) for 200 volt supplies, and 4s. per 8-candle power lamp fixed (or £6 5s. per kilowatt) for 250 volt supplies, spread uniformly over the twelve months; and all units consumed to be charged in addition at the rate of 1¼d. per unit. (3) All consumers who take a supply for the equivalent of five hours or more per day for 365 days per annum to be charged throughout at the rates of 2¼d. per unit for 100 volt supplies, 2d. per unit for 200 volt supplies, and 1½d. per unit for 250 volt supplies. The quantity of electricity sold to private consumers during the past year was 2,566,016 units, as compared with 1,885,902 units during the previous year; being an increase of 36·06 per cent. The number of private consumers on May 31, 1899, was 1858, as compared with 1437 at May 31, 1898; being an increase of 421, or 29·29 per cent., during the year. There were 52 consumers who took the equivalent of five hours or over per day of their maximum demand throughout the year. The number of motors in use and supplied off the Corporation mains as at May 31, 1899, was 78. The accounts were approved, on the motion of Bailie Maclay, who said they had a net balance on the right side of £1941. He thought this was eminently satisfactory, because they had just passed through a very trying year. They had spent largely on capital account, and this capital expenditure was to a large extent unproductive. As illustrative of this, he mentioned that they spent on capital account £100,000 in putting down new cables in the streets of the city. Of these cables, many last year were largely unproductive; but that would very shortly adjust itself. He hoped they had been sowing good seed in a fertile soil, which would yield them in the near future good fruit in the shape of increased revenue. During last year the output of the electric current increased something like 36 per cent., the number of consumers increased by 30 per cent., and the number of 8-candle power lamps had increased by something like 17 per cent. They had laid throughout the city in all 18 miles of new cables and 28 miles of distributing mains. As to street lighting, at the end of the previous year they had something like 119 street-lamps. At the end of last year they had 227, or nearly double. These lamps had not yielded much revenue last year, because they were only in use for part of the winter. They would

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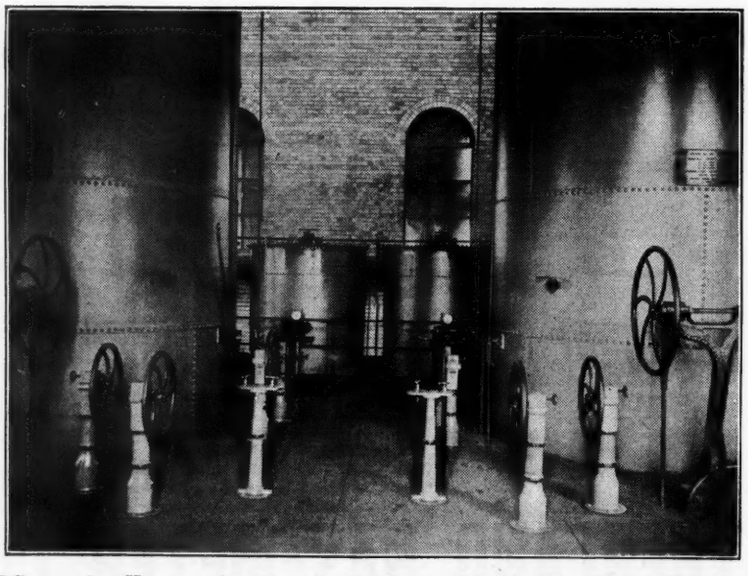

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be all in use for next winter. As they were aware, the original charge for a street-lamp was £26; some little time ago they reduced it to £18; and they had now reduced it to £14, which, he believed, was the lowest price for a street-lamp in Great Britain. They had done this in order to encourage street lighting; and he had been pleased to learn that the Watching and Lighting Committee were prepared to go on with an extensive system of electric lighting of the streets of the city.

Mr. James Kincaid, of Falkirk, writes that the statements in our correspondent's "Notes" last week, that he recommended one process to the disparagement of another, and said the oil-gas plant was valueless, are erroneous. He says: "Briefly, the facts are these: The oil-gas bench was taken down, and retorts for carbonizing coal erected in their stead, previous to my taking up office in Falkirk; and, in addition, the oil-gas plant generally was in very bad repair. In recommending the erection of additional washing plant, I decided to place the machine where the oil-gas meter stood—no other site being suitable. Without questioning your correspondent's ability as an engineer, I would ask what does he know of this particular case that he should caution 'bodies who, like the Corporation of Falkirk, allow themselves to be persuaded by a new Manager'? What are managers engaged for?" Mr. Kincaid adds that he has never referred adversely to the Peebles process; and he offers no objection to our correspondent's advocacy of its claims, "provided he does so in a different fashion."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 19.

Sulphate of Ammonia.—The market opened very firm; and, although a quieter tone has supervened, prices are fully maintained—the closing quotations being £12 6s. 3d. to £12 10s. per ton, delivered f.o.b. at the ports. Available supplies have been limited, and have been readily absorbed by direct demand, though buyers have successfully resisted any further advance in the absence of speculative buying. A fair business has also been done for September delivery on the level of prompt prices. In the forward position, makers have maintained a firm attitude; and buyers have not been much interested at the advanced prices required.

Nitrate of Soda is firm in all positions; and the spot quotation is 8s. per cwt. for fine quality.

LONDON, *Aug.* 19.

Tar Products.—The values of products have not varied much during the week; the market still being under holiday influences. Not much business is being done, but that which has been transacted is at full market rates. There is a disposition in prices to grow in strength, particularly in respect to naphthas and toluol. There is again inquiry for anthracene, particularly in "B" qualities. Few makers have any to offer, while the large makers are all more or less committed. The lessened production of anthracene, owing to its low price, is undoubtedly being felt in the quantities for disposal.

The average quotations during the week are as follows: Tar, 16s. to 25s. 6d. Pitch, east coast, 34s.; west coast, 31s. Benzol, 90's, 8d.; 50's, 10d. Toluol, 1s. 2d. Solvent naphtha, 1s. 3d. Heavy naphtha, 1s. Crude, 30 per cent., naphtha, 3¾d. Creosote, 3⅜d. Heavy oils, 65s. Carbolic acid, 60's, 2s.; 75's, 2s. 6d. Creosote salts, 50s. Anthracene, nominal, "A," 4d.; "B," 2½d. to 3d.

Sulphate of Ammonia.—There has been a steady market during the week, but with no very important business doing. Values of sulphate are maintained; and the tendency is to higher rates. There is a good deal of inquiry in the market for forward delivery; but buyers are offering somewhat less prices, which so far makers will not look at. To-day's value in all positions is about £12 5s. to £12 7s. 6d., less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position in the coal trade here shows no material change. The better qualities of round coal continue only in very limited request for house-fire purposes; but pits are still kept on four to five days per week, and the surplus output is not at all such as to cause any pressure upon the market, as collieries are generally exceptionally short of stocks, and any production not needed for domestic consumption is required to replenish these. Prices consequently are firm at recent full list rates. The lower descriptions of round coal move away readily, with selling rates well maintained, and colliery proprietors very cautious about entering into forward contracts except at some advance or under a sliding-scale arrangement. Engine fuel continues scarce; and prices for all descriptions are strong, with a decided stiffening tendency on the better qualities, and an advance on present rates obtained on forward contracts; the basis on which these are generally being settled representing about 2s. 1d. to 2s. 3d. per ton above last year's prices. Shipping is only moderate, with prices unchanged. Coke continues to harden. At the pitmouth, best Wigan Arley averages 11s. 6d. to 12s. 6d. per ton, Pemberton four-feet and seconds Arley 10s. to 11s., common house coal 9s. to 9s. 6d., steam and forge coal 8s. 9d. to 9s., and engine fuel 6s. 6d. to 6s. 9d. for best, 5s. 6d. to 5s. 9d. for medium, and 4s. 9d. to 5s. for common slack. Delivered at the Mersey ports, ordinary steam coal averages about 9s. 6d. to 10s. per ton. Contracts for ordinary furnace coke at the ovens are being placed at 18s. 6d. to 19s. per ton.

Northern Coal Trade.—There is a strong tone in the coal markets generally, though it is not equal in regard to all classes of coal. As the nights draw in, there is an increase naturally found in some departments that have been a little neglected in the summer. Best Northumbrian steam coals are very firm; and there is still a scarcity for prompt loading—the general quotation being now 13s. per ton f.o.b., while second-class steam coals command 12s. 3d. per ton, and steam smalls 7s.—the latter quality being rather scarce. Manufacturing coals are steady at old prices, being usually contracted for; but the demand is a very full one at present. In the gas coal trade, the requirements are now slowly and

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steadily increasing; and there is a decided firmness in the market. Prices quoted now are from 9s. 6d. to 10s. per ton f.o.b. in the Tyne, but much of the coal that is being delivered is on the contracts entered into four months or so ago at lower prices. No contracts of moment are reported for the last few days. In the coke trade, there is a strong demand, and that at prices which beneficially affect the gas coke trade. In the latter, the production is now beginning to be enlarged; and the output is well taken up both for home use and for export. There is no alteration in the price of gas coke this week.

Scotch Coal Trade.—Trade remains unchanged. All classes of coal move off freely, and prices are firm. The quotations are: Main 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow, ell 9s. 6d. to 10s. 3d., and splint 10s. 3d. to 10s. 6d. The shipments for the week amounted to 184,348 tons—a decrease of 11,079 tons upon the previous week, and of 32,297 tons upon the corresponding week of last year. The total shipments for the year to date amount to 5,279,205 tons—a decrease upon the same period of last year of 591,446 tons.

The Purchase of the Ossett Gas-Works.—The Ossett Town Council yesterday week empowered an Executive Committee to carry into effect the resolution of the Town Council, by promoting a Bill in Parliament next session for the purchase of the undertaking and works of the Ossett Gas Company.

Thirlmere Water for Wigan.—The Wigan Corporation having made arrangements with the Manchester City Council for the supply of 200,000 gallons of water daily from the Thirlmere aqueduct, the necessary connection was made at Adlington, and the ceremony of turning on the water took place at Wigan last Tuesday. The incidental works have cost about £12,000.

Carlisle Gas and Water Supply.—Last Tuesday, Colonel E. Hepper, R.E., held an inquiry at the Town Hall, Carlisle, into an application made to the Local Government Board by the Corporation for sanction to several loans, among them being £17,000 for gas-works purposes and £3000 for the water undertaking. Dealing first with the application for £17,000, the Town Clerk (Mr. A. H. Collingwood) explained that the various sums making up this total included £130 for works, £8618 for mains, £1451 for lamps, and £9299 for meters. In regard to the mains, £3000 had already been spent; on the lamps, £651; and on the meters, £5000. The Inspector remarked that prepayment meters appeared to be popular in Carlisle; and the Gas and Water Engineer (Mr. C. B. Newton) replied that they were. It was next explained that the application for leave to borrow £3000 for works of water supply had reference to works within the city, such as extension of mains to new streets; and in no case was the money to be spent on renewals. In reply to the Inspector, Mr. Newton stated that when the new water supply from the Gelt was brought to the city, it would be connected with the mains. He hoped the scheme would be completed in three or four years. The work would be commenced next spring. The water would come from an area of 7000 acres, on which there was only one habitation—a shepherd's cottage. The other proposed loans were then dealt with, and the inquiry closed.

Goole Gas Supply.—At the meeting of the Goole Gas and Water Committee on Monday last week—Mr. Turton in the chair—Mr. Blyth opposed the proposed reduction of 2d. per 1000 cubic feet in the price of gas; but eventually the minutes were passed with only two dissentients. The report and balance-sheet submitted by the Manager (Mr. Matt. Dunn) showed that the total increase in the profits on the gas undertaking was £1354. The Chairman remarked that the reduction in the price would make a difference in the profits of £375; but he hoped this would be counterbalanced by a larger sale. The reports and accounts were adopted.

Penny-in-the-Slot Gas Supply.—Chronicling the fact that even in Little Yeadon the Gas Company finds the penny-in-the-slot meter popular and profitable (for the number of the Company's customers of this class has increased during the last twelve months from 163 to 272); while in Manchester, out of 119,000 consumers on the Corporation's books, 27,000 use slot meters, and the increase in the year has been 4000, the "Bradford Observer" remarks: "This extraordinary development of a mode of gas supply which was at first regarded as a ludicrously hopeless experiment, might furnish a good theme for an essay, by a suitably endowed social philosopher, on the queer economics of poverty, and the profitableness of the prepaid penny as compared with quarterly or half-yearly credits." With regard to the penny-in-the-slot system and the bronze coinage, some idea of the effect of the introduction of this popular system of supply in London on the circulation of bronze coins may be gathered from an interesting article in last Friday's "Daily Telegraph." Referring to the application of the system to gas supply, and taking only the South Metropolitan Gas Company, who have 90,000 prepayment meters in use, and are putting them in at the rate of 300 a week, the writer points out that, on an average, 72 pennies are taken out of each meter every six weeks; making a total of 6,480,000 coins, the weight of which would be over 60 tons. If this sum were to be taken to the Company's offices, 30 two-horse vans would be required; but each collector hands the produce of his district into the nearest branch of the London and South-Western Bank. The collectors are engaged every day in the year, except Bank Holidays and Sundays; bringing in, on an average, nearly 2 tons of coppers. Roughly speaking, 10 tons of coppers are put into the meters every week; so that at the end of the six weeks, and before the collection is made, 60 tons of pennies are practically withdrawn from circulation. Naturally the question arises: "How is this money circulated anew?" There is nothing simpler. Tradesmen have arrangements with their banks by which they get supplies of coppers, which are thus given back to the public. A few consumers—but very few, considering that there are not far short of 100,000—take a shilling's worth from the collectors as they gather in this perpetual harvest. It is estimated that there are £2,000,000 worth of coppers—pennies, halfpennies, and farthings—in circulation; that is, roughly speaking, 4466⅔ tons of coppers. Year by year varying amounts of these coins are struck at the Mint, and generally an increasing quantity, owing, it is believed, to the suspense amounts, so to speak, held by the ubiquitous automatic machines and the prepayment gas-meters.

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The Gas and Water Undertakings of the Heywood Corporation.—The Borough Accountant of Heywood (Mr. W. H. Booth) has just issued his annual report on the finances. It shows that the profit on the gas undertaking in the past financial year was £1638, against £1436 in the previous year, although the price of gas had been reduced since September last, and during two of the heaviest quarters in the year, by 2d. per 1000 cubic feet—the consumption having increased in the financial year by nearly 4 million cubic feet. From the profit, the Gas Committee have transferred in aid of rates £1379; the balance of £259 being placed to the reserve fund, which stands at the substantial sum of £3000. Under the provisions of the Heywood Water-Works (Transfer) Act, 1898, the water-works are now transferred to the Heywood and Middleton Water Board; and the accounts for the half year ended Sept. 30, 1898, are the last the Corporation have directly to deal with. They show a deficiency on the revenue account of £1 2s. 2d. This, with the deficiency of £396 9s. 10d. for the financial year ended March 31, 1898, will be solely met out of the Heywood rates, and is provided for in the current year's estimates. Under the Act, all future deficiencies will be met *pro rata* out of the rates levied by the Heywood and Middleton Corporations respectively. It is also provided by the Act that the first profits made by the undertaking up to a total of £25,000 shall be paid to the Corporation of Heywood, to make good the deficiencies which have been hitherto borne by the rates of the town.

The Fatal Accident at the Oil-Gas Works of the Lancashire and Yorkshire Railway Company.—Last Wednesday, an inquest on the body of James Wren, who was killed on Sunday, the 13th inst., by an explosion at the oil-gas works of the Lancashire and Yorkshire Railway Company (*ante*, p. 448) was held before Mr. Aiken, the Deputy-Coroner for the City of Manchester. It appeared from the evidence of five men employed at the works that the deceased, who was then in charge of them as head gas maker, breakfasted there on the day of the accident. He then went into the receiver-house, where one of the receivers had air pumped into it from half-past seven until nine, when an explosion—or, according to one witness, two explosions, occurred, a few seconds intervening. One of the men was blown 20 yards away, but was not much hurt. The deceased was found leaning against the wall of the receiver-house in flames up to his waist. William Smith, inspector of the works, who had given an order to draw off the gas from a receiver, stated that the gas would go into the holder, and would be pumped therefrom into another receiver. This would not be done more than once in twelve months. Smoking was strictly prohibited in the works. Witness arrived a few minutes after the explosion, and found Wren lying on the ground. He asked how it had occurred; and Wren replied that he could not tell, but that the pressure was 130 lbs. There was a brass valve on the pump which regulated the pressure, so that it ought not to exceed 150 lbs. The oil from which the gas was made was Anglo-American. The witness had no theory to account for the explosion, but said he did not think it could have been caused without a light of some kind. The Jury returned a verdict of "Accidental death," and added a recommendation that further inquiry should be made by an expert to ascertain the probable cause of the accident.

The Condemned Water Reservoir at Winsford.—A special meeting of the Winsford Urban District Council was held last Wednesday evening to consider the situation consequent upon the Local Government Board's condemnation of the water reservoir (see *ante*, p. 390). The Clerk reported having written to Mr. Bancroft, the Consulting Engineer, asking if, in his opinion, the work would have been sufficiently strong if the reservoir had been built in accordance with the plans approved by the Local Government Board. In reply, he wrote that, presuming the Board had copies sent to them of the contract drawings, which he had seen, he should say most distinctly "No," because the outside walls were too thin, the batter was on the wrong side, &c. A long discussion took place, and the whole of the correspondence was carefully sifted. The Clerk of the Works was also cross-examined, and the plans were inspected. The Council expressed themselves satisfied that the Local Government Board had approved the original plans; that the thickness of the walls was exactly as agreed to by them; that the tracing to which they particularly referred in their letter of condemnation was inaccurate in several vital particulars; and that the Board were responsible, inasmuch as they had expressed their approval of the scheme, and passed the plans originally submitted. It was decided that, before further action was taken, a Committee, with the assistance of the Clerk, should frame a reply to the Board.

Oldham Water Supply.—The members of the Oldham Corporation recently made their annual inspection of the water-works. They were accompanied by Mr. G. H. Hill, their Consulting Water Engineer, who at the luncheon gave the company his opinion on the condition of the works. He said he found everything in satisfactory order, which showed that they were carefully looked after by the Manager (Mr. C. J. Batley) and his staff. Mr. Hill went on to speak of the extension of the system by the addition of the Rooden reservoir, now approaching completion. The present consumption in Oldham was 5 million gallons a day. Water engineers adopted as a standard test the three dry years of 1887, 1888, and 1889, which were the three driest consecutive years on record. If three such years occurred again, Oldham would in the third year only be able to supply 4 million gallons per day. The town was now abreast of its consumption, and had the future before it to look to; so it was time for them to take the matter into consideration. They would have to seek new powers for any further supply; and it would take two years to get their Bill through Parliament and five years to construct the works. It would therefore be at least seven years before they got any water. He thought water supply should always be five years at least in advance, and not just "neck and neck." The Chairman of the Water Committee (Mr. Ashworth) said the Committee were fully alive to the very important matter to which Mr. Hill had referred. As to the consumption of water in Oldham, on one day recently, 10 million gallons were drawn from the reservoirs. A discussion took place between the Mayor (Alderman Jackson Brierley) and the Engineer on the probable effect of the extension of the water-carriage system on the consumption of water. Mr. Hill expressed the opinion that it could not fail to have the effect of increasing the quantity of water used; but the Mayor took rather a different view.

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New Water-Works for Carmarthen.—New water works are to be constructed at Carmarthen, the reservoir to have a capacity of about 17 million gallons, on a site some three miles distant.

Totnes Public Lighting.—The action of the Totnes Gas Company, in connection with the lighting of the public lamps, may be instructive to other similar bodies. They have made it a condition of their contract for the lighting of the town during the year from Michaelmas next, that they do not hold themselves responsible for lights going out consequent on defective incandescent mantles and flash-lights. This has been accepted by the Town Council.

The Newtown District Council and the Gas-Works.—A report has just been submitted to the Newtown Urban District Council from their Parliamentary Agents on the advisability of the Council taking advantage of the purchase clause which they obtained with the Newtown Gas Order (see *ante*, p. 46), and promoting a Bill next session for the purchase of the undertaking as a non-statutory concern. It was decided to print the report for circulation among the members.

Oswestry Public Lighting.—At the Oswestry Town Council meeting last week, a discussion took place as to the lighting of the public streets. The Corporation, having decided to purchase the Electric Light Company's undertaking, served a notice on the Gas Company to terminate the present contract at the end of next month. The Council have applied to the Local Government Board for sanction to borrow the necessary money; but the usual inquiry had not been held, and the Watch Committee were therefore obliged to ask the Gas Company whether they would be prepared to enter into a temporary arrangement to continue the present agreement. The Company replied that they would continue to do so on the following terms: £3 3s. per lamp per annum if the number of street-lamps was not reduced below 150; and £3 5s. if below that number. The Corporation are at present paying £3 per lamp per annum. It was decided to continue the contract until the lamps are lighted by electricity.

New Gas-Works for Malvern.—Mr. H. P. Boulnois last Tuesday held an inquiry at Malvern in regard to an application made by the District Council to the Local Government Board for sanction to a loan of £20,000 for gas-works purposes. Mr. Nevile (Chairman of the Gas Committee) said the present works were quite inadequate for the requirements of the district. As the site of the Link works, recently acquired by the Council, was close to the railway, and would save about £400 a year in cartage alone, it was proposed to transfer all the manufacture to that site, and use the existing Malvern works for storage and distribution. The present holders and mains would not be interfered with. The Surveyor said the manufacturing power was now 400,000 cubic feet a day, which would be increased at the new works to 1,000,000 cubic feet. The greatest output last year in 24 hours was 515,000 cubic feet. The consumption of gas in Malvern had doubled within the last ten years, and was still rapidly increasing. Mr. J. Miles Evans adversely criticized the action of the Council with regard to the gas-works, and asked what had been the cost to the ratepayers of the Link undertaking. The Clerk said the award was £22,100; but the costs of the arbitration had not yet been taxed.

The South Molton Gas-Works and the Burdens of Posterity.—In response to a memorial from a number of the gas consumers, the South Molton Town Council have decided to reduce the price of gas, which is now 4s. 7d. per 1000 feet. The amount of the reduction is to be fixed by the Gas Committee. South Molton is the town in which it was suggested that it is unfair to lay upon the consumers of gas the whole burden of paying for the acquisition of the gas-works for the benefit of posterity. (See "JOURNAL" for the 16th of May, p. 1299.) Last year's working left a small margin after allowing £306 for interest and sinking fund; and if there is to be an appreciable reduction of the price, a call may have to be made upon the rates to meet a portion of these charges. The majority of the Town Council, however, take the businesslike view that a reduction in price will probably produce a larger demand. Mr. D. Richards, in moving that the request for a reduction be granted, said that, although the price was lowered two years ago, they still had a credit balance. Mr. J. A. Kingdon pointed out that there was a profit of £92 after meeting all the expenditure last year; and he, as well as Alderman D. J. C. Bush and the Mayor (Mr. J. Sanders), argued strongly for a reduction, on the ground of the unfairness of making the consumers redeem the whole liability on the undertaking in some seventeen years. On a division, seven voted for a reduction, and two against it.

Cost of Gas and Electricity.—At the meeting of the Lee District Board of Works last Wednesday, Mr. Stanley Read brought forward some instructive figures relative to the cost of electricity and gas. He said that, after most careful experiments in his own house, he found that, light for light, electricity cost three times as much as gas. The Chairman of the Board (Mr. White) remarked that the cost of lighting the City of London previous to the introduction of electricity was £11,300, and that last year the Corporation paid £12,400 for electricity and £6400 for gas.

Faversham Water Supply.—The question of the water supply at Faversham is assuming a very serious aspect. For some two or three years past dissatisfaction has been expressed; and matters came to a head a day or two since, when the Water Company gave notice that, owing to the drought, the water would be shut off from 6 p.m. till 5 a.m. At a meeting of the Town Council last Tuesday an animated discussion took place on the subject; and in the end a proposition by Mr. Austin that a Committee of the whole Council should meet and consider the desirability of purchasing the works was carried. Of the twelve members of the Council present, five were debarred from voting on account of their connection with the Company.

The Disposal of the Surplus Funds of the Fylde Water Company.—A meeting of the Fylde Water Company was held last Wednesday at Blackpool, when dividends of 10 per cent. on the "A" stock, 7 per cent. on the "B" stock, and 4 per cent. on the preference stock were declared for the half year ending Aug. 31, when the Company's works will be transferred to the Fylde Water Board. Mr. W. B. Rideal, of Preston, submitted the report with respect to the disposal of the surplus funds, amounting to £37,000. The Committee recommended that 1⅓ years' interest be paid to the stockholders, which would absorb £28,000; also that £3000 be paid to the Chairman and £1000 to Mr. Arthur, the Secretary—the balance to be apportioned as the Directors might think proper among themselves and the officials of the Company. Mr. J. A. Parkinson seconded this proposal. Mr. Topping characterized the proceedings of the Committee as a farce, and absolutely unfair. He proposed an amendment, that the stockholders have 1⅓ years' dividend; the Chairman, £2500; the Secretary, £1000; the Manager, £750; the Assistant-Manager, £300; the collector, £300; each Director, £300; the Auditor, three years' salary; the Engineer and Solicitor, 100 guineas each; and the nine clerks, various amounts. This would leave a small balance in hand, which could be distributed among the workmen. Mr. W. Bradley seconded the amendment, which, after further remarks, was carried on a show of hands. But the Secretary explained that the manner of voting was on the value of the stock held, and on this 869 voted for the amendment and 453 against it. The number of proxies in favour of the motion was, however, 3471; which brought the number of votes in favour of the Committee's report to 3924, and against it to 869. The report was adopted; and the Committee were thanked for their services.

The Glasgow Corporation have placed their annual contract for gas-retorts and fire-clay bricks with the Glenboig Union Fire-Clay Company, Limited.

The Gas Committee of the Stratford-on-Avon Corporation have placed with Messrs. Biggs, Wall, and Co. an order for one of their "Rapid" charging-machines.

The Corporation of Stoke-upon-Trent have placed with Messrs. W. C. Holmes and Co., of Huddersfield, an order for a patent new scrubber-washer, to treat a million cubic feet of gas per diem.

The successful opposition of the Lewes Water-Works Company to the Bill promoted last session by the Newhaven and Seaford Urban District Councils involved an expenditure by the Company of close upon £600.

An important installation of incandescent gas-lights has just been made by the New Sunlight Incandescent Company, Limited, at the Technical Education School of the London County Council, St. Martin's Lane, W.C. This establishment is the Training School for the County Council Inspectors.

At the recent annual meeting of the Leeds Fire-Clay Company, Limited, at which a dividend at the rate of 7 per cent. per annum for the half year (making, with the interim dividend, 6 per cent. for the year) was declared, it was stated that the factory was very busy, and that an engineering department had been added to enable the Company to carry out contracts with gas-works.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKLEMANN'S ORIGINAL "VOLCANIC" FIRE CEMENT and "VOLCUM" PASTE. Always ready for use in GAS-WORKS. Resists 4500° Fahr.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street, E.C.
"Volcanism, London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

MELROSE CYCLES

SHOULD be bought by Gas and Water Officials. Ladies' No. 1, £10 10s.; No. 2, £8 10s. Gents' No. 1, £10; No. 2, £8. Highest Quality. Twelve Months' Guaranty. Sent on approval. Catalogue free. MELROSE CYCLE COMPANY, COVENTRY.

SEASON 1899.

BALE'S OXIDE OF IRON, of finest Quality. Summer delivery specially recommended for efficiency and economy.
FIRE CEMENT, PAINT, and CHEMICALS.
120 and 121, NEWGATE STREET, LONDON, E.C.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see Aug. 1, p. 332.]

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BENZOL, specially made for the Enrichment of Gas.
ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

PRACTICAL RETORT SETTER.

GEORGE NUTTALL, 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SHEFFIELD CHEMICAL COMPANY, LIMITED.

BUYERS of Spent Oxide. Sellers of OXIDE OF IRON and SULPHURIC ACID.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

IRON OXIDE (Bog Ore), best quality, for the Purification of Gas, containing up to 85 per cent. Hydrated Oxide of Iron, and absorbing while being used a high percentage of Blue.
S. BOWLEY AND SON, Wellington Works, Battersea Bridge, LONDON, S.W.

WANTED, a Draughtsman. One accustomed to Bench and Furnace Work preferred.
Apply to JONAS DRAKE AND SON, Ovenden, HALIFAX.

WANTED, a Situation as Gas-Fitter. Used to Compo., Iron, Stoves, &c. Eleven Years' Experience. Excellent Testimonials.
Address No. 3331, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED a re-engagement as Engineer and MANAGER of a Gas-Works. Make 100 to 700 Millions per annum. Highest References. Age 40. Married.
Address No. 3327, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER, well known in the Gas World, seeks an appointment as OUTDOOR SUPERINTENDENT or TRAVELLER. Age 40. Married. Best References.
Address No. 3328, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER requires Situation in Gas-Works as DRAUGHTSMAN. Well up in Inclined Retort Installation, &c.
Address A.B., 9, Asplin Road, Tottenham, MIDDLESEX.

WANTED, immediately, two good STOKERS, used to Shovel Charging. Must be steady Men. Wages 28s. per week.
Apply to the MANAGER, Gas-Works, BEXHILL-ON-SEA.

WANTED, immediately, an Operator for Carburetted Water-Gas Plant. Wages 6s. per day. None but those having absolute charge of Apparatus and thoroughly understanding the work need apply. Permanent Situation.
Application, with References, to be made to the MANAGER, Gas-Works, BEXHILL-ON-SEA.

BLACKSMITH wanted. One who will make himself generally useful on the Works. Wages, 28s. per week.
Apply, stating Age, Experience, and References, to the MANAGER, Gas-Works, REDCAR.

ROTHERHAM CORPORATION.
(GAS DEPARTMENT.)

WANTED, One or Two First-class GAS-FITTERS.
Send Particulars, and state Wages required, to FRANK A. WINSTANLEY, Engineer and Manager.

WANTED, a Gas Manager, for a small Works, making 3½ Millions per annum. Must be capable of laying Mains and Services, fixing Meters, &c. Assistance given in Winter Months. Wages to commence at 26s. per week, with House, Gas, and Coal free.
Apply, by letter (with Testimonials), to No. 3330, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an experienced Man, able to lay Mains, Services, fix Meters, &c., to take charge of a small Gas-Works near London. Annual Make, about 2½ millions. Wages, 25s. per week, to which House, Coal, and Gas will be added.
Applications, with Testimonials, to be addressed, by the 4th of September, to No. 3329, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE GASLIGHT AND COKE COMPANY.

WANTED, at the Beckton Station of the above-named Company, an ASSISTANT ENGINEER having the following qualifications—viz.: Three Years' Professional training as Pupil, Two Years' service as Gas Engineer's Assistant, with a general knowledge of the routine of a Gas-Works and a fair knowledge of mechanical draughtsmanship.
He will be required to live on the Works, where a Residence, with Gas and Fuel, is provided.
Commencing Salary according to qualifications, rising by annual increases to £250 per annum.
Applications, with Particulars of Qualifications and References, to be made, by letter, to the undersigned not later than the 14th prox.
By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.
Chief Office: Horseferry Road,
Westminster, S.W., Aug. 14, 1899.

BUSINESS FOR SALE.

TO Let or Sell, with Immediate Entry— The GAS-WORKS and PLANT at Kincardine-on-Forth as a going concern, with Manager's House, &c.
Offers to be lodged with CLARK AND ROSS, Solicitors, KINCARDINE.

WENHAM LAMPS FOR SALE.

FIVE handsome Porcelain Lamps, not required on account of alterations.
S. C. DUNK, 99, ANERLEY ROAD, S.E.

"KING'S TREATISE ON COAL GAS"

FOR SALE, in excellent preservation— Three Volumes, complete; Half Morocco. What offers?
Address No. 3326, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ROTHERHAM CORPORATION GAS DEPARTMENT.

FOR SALE—a second-hand Rotary EXHAUSTER, capable of passing 40,000 cubic feet per hour, in splendid condition. Can be seen any time. No reasonable offer refused.
FRANK A. WINSTANLEY, Engineer and Manager.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

KILDWICK PARISH GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR made during the Year ending Aug. 31, 1900, delivered into Tanks.
Tenders to be sent in to me not later than Sept. 2, 1899.
FRED. H. PICKLES,
Manager and Secretary.
Gas-Works, Kildwick,
Aug. 14, 1899.

FOR SALE, cheap to clear—
TOWER SCRUBBER (Walker), 5 ft. by 25 ft. high, complete.
STATION METER, 8-inch, complete and perfect.
EXHAUSTER and ENGINE, combined (Waller), 9-inch Valves, Governors, &c., complete.
GASHOLDER, 35 ft. by 14 ft. deep, only Six Years old.
CAST-IRON TANK, 31 ft. dia., 12 ft. deep, nearly new.
Four 10-feet PURIFIERS, Centre-Valve and Connections.
EXHAUSTERS, sizes from 4000 to 30,000 Cubic Feet per hour in stock.
J. FIRTH BLAKELEY & Co., Gas Engineers, Thornhill, DEWSBURY.

NORTHAMPTON GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors are prepared to receive TENDERS for the purchase and removal of the surplus TAR produced at their Works for a period of One or Two Years from Oct. 1 next.
The quantity produced is about 3000 Tons per annum.
Further Particulars may be obtained on application.
The Directors do not bind themselves to accept any Tender.
Tenders, marked "Tender for Tar," to be delivered at the Company's Office on or before Tuesday, Aug. 29 next.
JOHN EUNSON,
Engineer.
Gas-Works, Northampton,
Aug. 9, 1899.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

OXIDE OF IRON.

THE Gas Committee are prepared to receive TENDERS for the supply of 800 Tons of OXIDE OF IRON PURIFYING MATERIAL.
Full Particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Oxide of Iron," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, Aug. 24, 1899.
The Committee do not bind themselves to accept the lowest or any Tender.
L. C. EVANS,
Town Clerk
(*pro tem.*).
Town Hall, Salford,
Aug. 14, 1899.

CLACTON URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE above Council invite Tenders for the supply of about 2500 Tons of GAS COAL, extending over a period of Twelve Months, to be delivered in quantities as required.
Full Particulars and Form of Tender may be had on application to the Manager of the Gas and Water Works (Mr. S. Francis), Rosemary Road, Clacton-on-Sea.
Tenders, sealed and endorsed, must be on the prescribed Form, and delivered to the undersigned not later than Wednesday, Sept. 6, at Four o'clock p.m.
The Council do not bind themselves to accept the lowest or any Tender.
GEO. T. LEWIS,
Clerk.
Town Hall Buildings,
Clacton-on-Sea, Aug. 17, 1899.

COUNTY BOROUGH OF HALIFAX.

TO BOILER MAKERS, PLATERS, &c.

THE Corporation of Halifax are prepared to receive TENDERS for the supply of a number of Wrought-Iron and Steel TANKS for their Tar Distillation Works, Charlestown Road, Halifax.
Full Particulars, Specification, and Form of Tender may be obtained on application to Mr. Thomas Holgate, M.Inst.C.E., Mulcture Hall Road, Halifax.
Tenders, endorsed "Tar Plant," must be sent to the undersigned not later than Ten o'clock a.m. on Wednesday, the 30th of August, 1899.
The person whose Tender is accepted will be required to observe the Fair Contracts Clauses adopted by the Corporation.
The Corporation do not bind themselves to accept the lowest or any Tender.
By order,
KEIGHLEY WALTON,
Town Clerk.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 8th of September, 1899, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1899, to declare Dividends, to elect Auditors, and for other purposes.
The TRANSFER BOOKS of the Company WILL BE CLOSED from the 26th of August to the 8th of September, both days inclusive.
By order,
ERNEST L. BURTON,
Secretary.
5, Great Winchester Street,
London, E.C., Aug. 21, 1899.

KNARESBOROUGH URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the supply and delivery during the ensuing Twelve Months, of about 1700 Tons of screened GAS COAL, in Monthly quantities as required.

They are also prepared to receive OFFERS for the purchase of the TAR and AMMONIACAL LIQUOR made at the above Council's Works during the same period.

Tenders to be in by the first post on the 28th of August, adaressed to

T. MAINMAN,
Clerk to the Council.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

TO CAPITALISTS AND OTHERS.

SWANSEA, GLAMORGANSHIRE.

JOHN M. LEEDER AND SON have received instructions from the Directors of the Swansea Gaslight Company to offer for SALE BY PUBLIC AUCTION, at the Royal Hotel, High Street, Swansea, on Tuesday, Sept. 5, 1899, at Half-Past Two for Three o'clock precisely in the afternoon, in 310 lots

£20,000
NEW ORDINARY STOCK, and
£6000
THREE-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK
OF THE
SWANSEA GASLIGHT COMPANY;

being part of the additional Capital of the Company authorized to be raised by the Swansea Gas Act, 1898, and pursuant to the provisions and conditions therein contained.

Purchasers of the New Ordinary Stock, 1898, will be entitled to three months' interest at 5 per cent. per annum as from the 1st of October, 1899, payable on the 6th of April, 1900; and purchasers of 3½ per cent. Perpetual Debenture Stock, 1898, to three months' interest due and payable on the 1st of January, 1900.

Particulars, with Conditions of Sale, containing all necessary Information, may be obtained on application to the SECRETARY and MANAGER of the Swansea Gaslight Company, Oystermouth Road, SWANSEA; or to the AUCTIONEERS at their Offices, 46, Waterloo Street, SWANSEA.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

ENRICH YOUR GAS
WITH CHEAP
BENZOL
SPECIALLY PREPARED, FREE FROM SULPHUR.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER & CO., MIDDLESBROUGH.

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.

The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.

Apply to the Sole Makers:
THE WHESSOE FOUNDRY COMPANY, LIMITED,
DARLINGTON.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 115, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL CO., LD.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL CO., LD.
QUAYSIDE, NEWCASTLE-ON-TYNE.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— *LIMITED,* —
1, FENCHURCH AVENUE, LONDON, E.C.

HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

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HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

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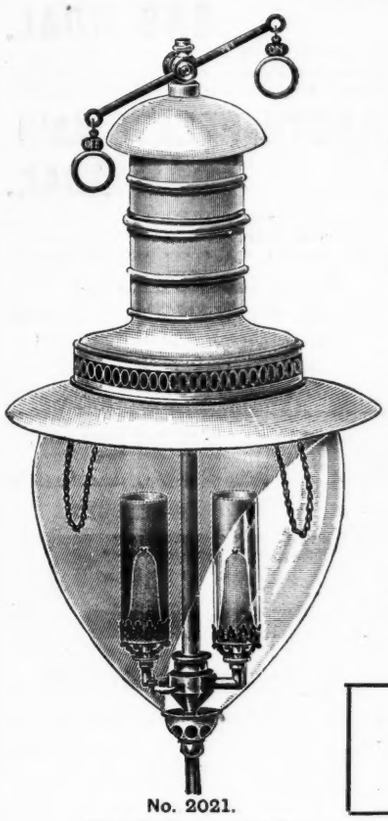
27 TO 35, DRURY LANE, LONDON.
SURREY WORKS, SMETHWICK.
BARNET WORKS, BIRMINGHAM.

Gas-Fittings Manufactory—SURREY WORKS, SMETHWICK.

THE

NEW "DRURY" SHOP LAMP

For Inside and Outside Lighting.



No. 2021.
WINDOW LIGHT.

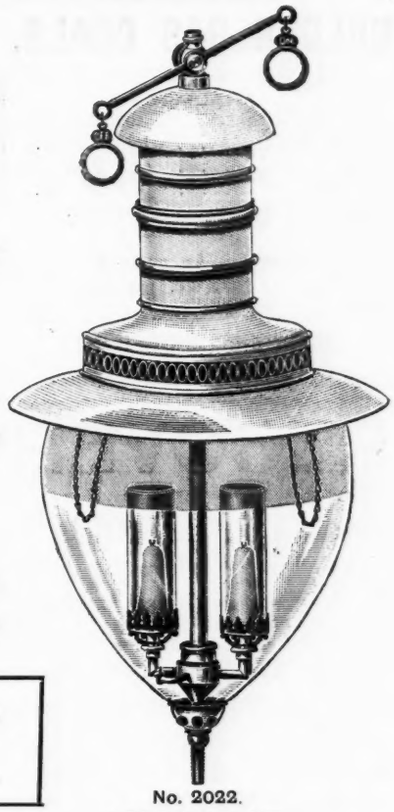
NEATLY ENAMELLED
IN FAWN COLOUR WITH
WHITE AND GOLD RELIEF.

No. 2020 is for Inside Lighting, with clear flint Globe.

No. 2021 is for Window Lighting, and has a diagonally obscured Globe.

No. 2022 is for Lobby Lighting, and has an opal top Globe.

A similar Lamp made for Electric Light.



No. 2022.
LOBBY LIGHT.

Prices:—

	1-Light.	2-Light.	3-Light.
No. 2020	**40s. 6d.**	**52s. 6d.**	**58s. 6d. each.**
No. 2021	**42s. 6d.**	**55s. 6d.**	**61s. 6d.** „
No. 2022	**50s. 9d.**	**66s. 0d.**	**72s. 0d.** „

Subject to Trade Discount.

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
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BOLDON GAS COALS.

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Yield of Gas per Ton.	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
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THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

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FITTED WITH STEEL ENAMELLED WHITE REFLECTOR.

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Fitted with the Patent Talbot Bye-Pass Tap and Clay's Anti-Vibratory Coil and No. 4 New Welsbach Burner.

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Telegrams: "Luminosity, London."

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
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TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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Coal Owners, Newcastle-on-Tyne;
or
E. FOSTER & CO.,
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G. R. HISLOP'S Patent Improved Lime Revivifying Apparatus.

SPENT LIME as carbonate is RESTORED at a cost considerably under that of New Lime, and that WITHOUT LIMIT to its DURABILITY, and with UNIMPAIRED EFFICACY as a Purifying Agent. The LIME is RESTORED on the PREMISES; ECONOMY of SPACE is SECURED by the non-accumulation of Spent Lime—thus SAVING all TROUBLE and EXPENSE in the disposal of the Lime as waste. The PROCESS can be USED in any LOCALITY without becoming a nuisance. Enquiries respectfully solicited. Full Particulars from Messrs. SAMUEL WHILE & SON, 60, Queen Victoria Street, LONDON, E.C.; or from the Principal Agent, R. F. HISLOP, F.C.S., Gas Engineer, Craigielea, PAISLEY.

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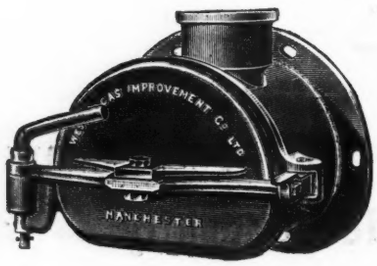
ALBION IRON-WORKS, MILES PLATTING, MANCHESTER;
AND 104, QUEEN VICTORIA STREET, LONDON, E.C.



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WEST'S PATENT REGENERATOR SETTINGS.
WEST'S PATENT SILENT COKE CONVEYOR.
RETORT MOUTHPIECES WITH SELF-SEALING LIDS.

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Raven's Lodge Fire-Brick Works, DEWSBURY.
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Proprietors of
ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.
VERY FREE FROM IMPURITIES.
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AND ALL CLASSES OF
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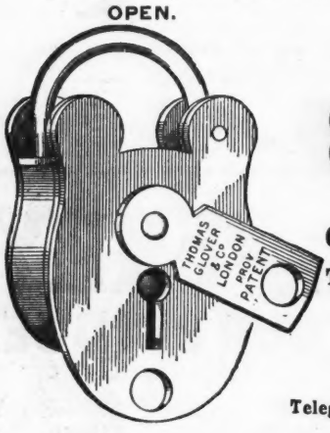

THOMAS GLOVER & CO.'S

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SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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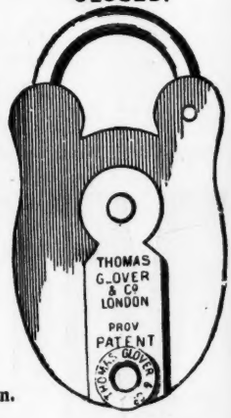

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BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

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Applications for **AGENCIES** now being received.

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A1. WHITE MANTLES.
Longest Lived and Highest Candle Power.

'SUNLIGHT' TINTED MANTLES.
Strongest and Pleasantest Colour.

These are **INTERCHANGEABLE** on same Burner.

BURNERS WITH CHIMNEYS.
Cheapest in the Market.

CHIMNEYLESS BURNERS.
Cheapest, Simplest, and Most Efficient.

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Only Efficient System.

A great sensation with this unique combination of features is promised to our Agents for the coming season. Any firm of standing, applying early enough, will be very favourably dealt with.

An early visit to the London Show-Rooms is especially solicited.

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Sunlight Tinted Mantles have been declared by the Courts to be "as far asunder as the Poles" from the Welsbach System, and we guarantee that our

SUNLIGHT WHITE MANTLES

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We give with every Mantle sold an absolute indemnity to both seller and user against all molestation on this account.

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SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.

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Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

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2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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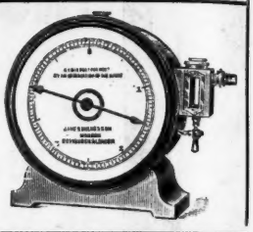

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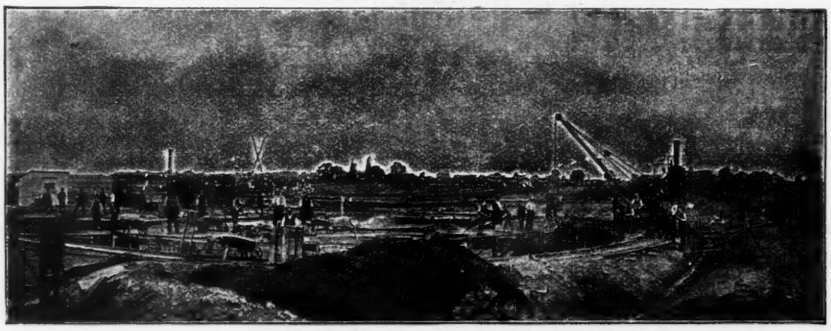

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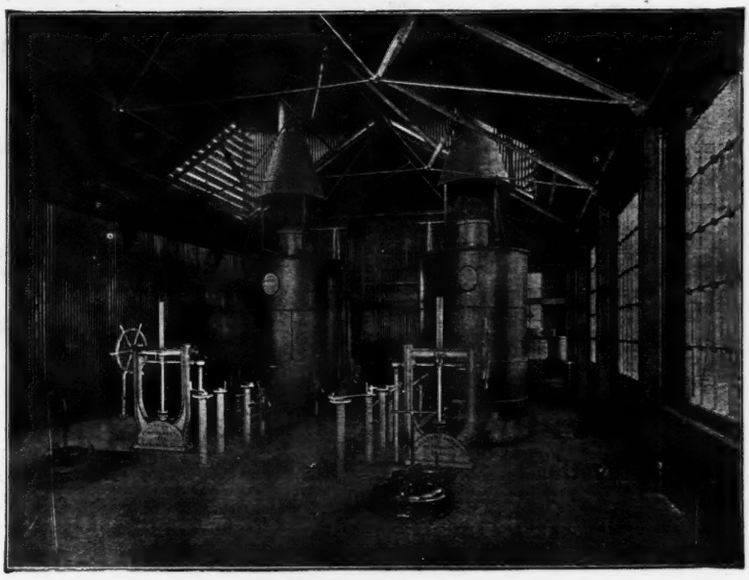
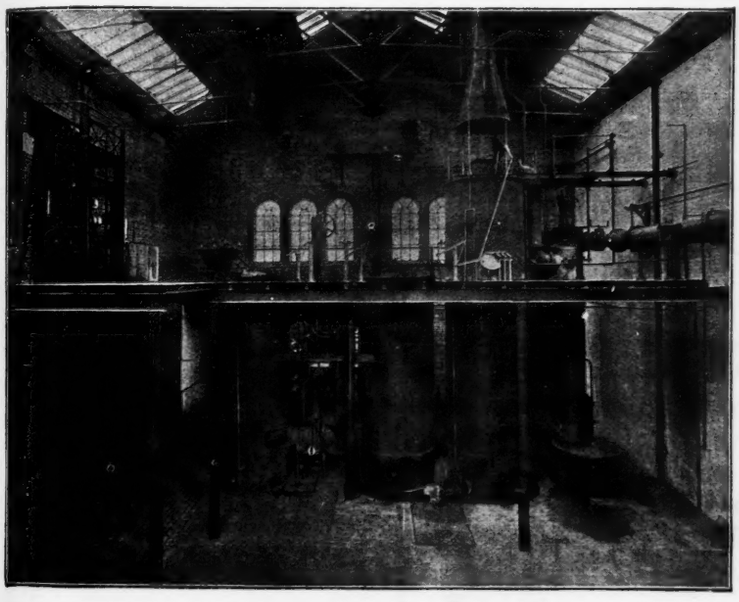
CARBURETTED WATER-GAS PLANT.



Water-Gas Plant at Southall.



Water-Gas Plant at Folkestone.

Carburetted Water-Gas Installations.

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SOUTHEND.
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SOUTHALL.
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HORSHAM.
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ADOPTED FOR MANY IMPORTANT GASHOLDERS.

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EVERY DESCRIPTION OF GAS-WORKS APPARATUS.

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Established 1860.

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GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
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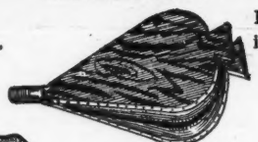
THOMAS BUGDEN,
Manufacturer of

Bellows for Inflating Gas-Bags. Made in various sizes.



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Special Air Tubing made for Gas Companies.

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ARROL-FOULIS
Patent Automatic Machinery
FOR
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Full Particulars may be obtained from the Sole Makers,
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GLASGOW.
[See Illustrated Advertisement, Aug. 1, p. 278.]

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Sulphate of Ammonia Plant
ON THE CONTINUOUS SYSTEM
Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.
Old Systems easily and cheaply converted.
ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.
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THE
PIONEERS OF NO CHIMNEYS,

still hold their own on the market for the

HIGHEST CANDLE POWER

for each Cubic Foot of Gas at ordinary Pressures.

The Syndicate's Three-Light Cluster, governed to consume only 24 Cubic Feet of Gas per Hour, gives

550-CANDLE POWER,

which speaks for itself.

The Syndicate works under the

BANDSEPT PATENTS;

and Bandsept, who was the first to adopt the Injector Principle, is

STILL AHEAD OF ALL RIVALS;

and the combination of his Burners with Welsbach Mantles can be fearlessly tested against any others

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AT THE
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RETORTS CAREFULLY PACKED FOR EXPORT.
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MACKRELL BROS.,
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Manufacturers of

IMPROVED GAS-METER PERSIANS.

UNSURPASSED FOR QUALITY AND VALUE.

MAKERS OF
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ALL KINDS GAS PLANT
12,100,000 CUB. FT. CAPACITY.
COMPLETED IN 12 MONTHS
GAS HOLDERS
SPECIALITE
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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View of Top of Retort-Bench, containing 484 Mouthpieces, showing Arch and Dip Pipes, Hydraulic and Foul Mains, &c., erected by R. & J. D., Ltd., at the Bradford Road Gas-Works of the Manchester Corporation.

W. PARKINSON & Co.

PREPAYMENT GAS-METERS.

Many Thousands in use in all parts of the Country.

COMBINE SIMPLICITY WITH STRENGTH.

ACCURACY WITH COMPACTNESS.

Adapted for use with PENNIES, SHILLINGS, or other English or Foreign Coins.

PRICE-CHANGING EFFECTED IN THE SIMPLEST MANNER AND WITH ABSOLUTE EXACTITUDE.

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[See also Advt. p 474.

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